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Florida Power Corporation
Crystal River Units 4 and 5

(U.S.) Environmental Protection Agency
Atlanta, GA

15 Sep 80

U.S. Department of Commerce
National Technical Information Service
NTIS

PB80-228034

United States
Environmental Protection
Agency

Region 4
345 Courtland Street, NE
Atlanta, GA 30308

EPA 904/9-80-048
July 1980

EPA

Environmental Impact Statement

Draft

Florida Power Corporation Crystal River Units 4 and 5

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Environmental Protection Agency, Region IV
345 Courtland Street
Atlanta, GA 30365

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Draft EIS

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Florida Power Corporation Proposes to construct and operate two 695 MW (gross) capacity coal-fired electric generating plants at the existing Crystal River complex in northwest Citrus County Florida. This EIS Examines project alternatives, impacts and mitigative measures related to groundwater, air, surface water, ecological, and socioeconomic and cultural systems.

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S-1-

JOINT
PUBLIC NOTICE

U. S. Environmental Protection Agency
Region IV, Water Enforcement Branch
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404/881-2328

in conjunction with

Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Public Notice No. 80FL109

September 25, 1980

NOTICE OF PUBLIC INFORMATION HEARING

ON

DRAFT ENVIRONMENTAL IMPACT STATEMENT, NOTICE OF PROPOSED ISSUANCE OF NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT, AND NOTICE OF CONSIDERATION FOR STATE CERTIFICATION OF THE NPDES PERMIT

A Draft Environmental Impact Statement (EIS) will be made available to the EPA Office of Environmental Review and to the public on or about September 26, 1980 on the Florida Power Corporation proposed Crystal River Power Plant Units 4 and 5 to be constructed in Citrus County, Florida near Crystal River by the U. S. Environmental Protection Agency (EPA).

In order to foster further public participation on the proposed issuance of necessary permit and determinations for the proposed project, a public information hearing will be held. The hearing is scheduled for October 28, 1980 and will begin at 7:30p.m. in the Auditorium of the City/County Building, 123 N.W. Highway 19, Crystal River, Florida. The hearing panel will include representatives from EPA and the State of Florida.

Both oral and written comments will be accepted and a transcript of the proceedings will be made. For the accuracy of the record, written comments are encouraged. The Hearing Officer reserves the right to fix reasonable limits on the time allowed for oral statements.

The U. S. Environmental Protection Agency proposes to issue a National Pollutant Discharge Elimination System (NPDES) Permit, NPDES number FL0036366. The permit application describes one proposed discharge from construction and operation of the facility which will generate and transmit electricity SIC Code 4911. Five internal serial numbers have been assigned for identification and monitoring purposes. The discharge will enter the existing discharge canal for Crystal River Power Plant Units 1-3 which enters the Gulf of Mexico between the Crystal and Withlacoochee Rivers. The Gulf has been classified by the State of Florida as Class III - Recreation - Propagation and Management of Fish - Surface Waters in this area.

The proposed NPDES permit contains limitations on the amounts of pollutants allowed to be discharged and was drafted in accordance with the provisions of the Clean Water Act (33 U.S.C. Section 1251 et seq.) and other lawful standards and regulations. The pollutant limitations and other permit conditions are tentative and open to comment from the public both in writing and at the public hearing.

A fact sheet which outlines the applicant's proposed discharge(s) and EPA's proposed pollutant limitations and conditions is available by writing or calling the EPA. A copy of the draft permit is also available from EPA. The administrative record, including the application, draft permit, fact sheet, environmental impact statement, comments received, and other information are available for review and copying at 345 Courtland Street, 2nd floor, Atlanta, Georgia, between the hours of 8:15am and 4:30pm, Monday through Friday. A copying machine is available for public use at a charge of 20c per page.

Persons wishing to comment upon or object ot the project, the Draft Environmental Impact Statement, the NPDES permit issuance, the proposed permit limitations and conditions and the State Certification of the NPDES permit are invited to respond in writing by November 10, 1980 to the U. S. Environmental Protection Agency, 345 Courtland Street, NE, Atlanta, Georgia 30365, ATTENTION: Mr. John E. Hagan, III; Chief, EIS Branch. The NPDES number, FL0036366 should be included in the first page of comments. All comments received by November 10, 1980, will be considered in the formulation of final determinations regarding the Final EIS, the NPDES permit and permit conditions, and the State Certification of the NPDES permit.

The EPA issued a public notice of the Preliminary Determination to give approval to construct Units 4 and 5 under the regulations for Prevention of Significant Deterioration of air quality, 40 CFR 52.21 on December 24, 1978. Subsequent to close of the comment period, approval was given by EPA on February 12, 1979.

A Final EIS will be published after the close of the public comment period. The Final EIS will consist of a summary of the Draft EIS, the Agency's tentative decision on this project, responses to comments received on the Draft EIS. the transcript of the public hearing, and any other relevant information or evaluations developed after publication of the Draft EIS. A copy of the Draft EIS should be retained if a complete evaluation of the project is desired.

After consideration of all written comments and of the requirements and policies in the Act and appropriate regulations, the EPA Regional Administrator will make determinations regarding permit issuance. If the determinations are substantially unchanged from those announced by this notice, the EPA Regional Administrator will so notify all persons submitting written comments. If the determinations are substantially changed, the EPA Regional Administrator will issue a public notice indicating the revised determinations. Requests for an evidentiary hearing may be filed after the Regional Administrator makes the above-described determinations. Additional information regarding evidentiary hearing is available in 40 CFR Subpart E, 45 FR 33498 (May 19, 1980), or by contacting the Legal Branch at the address above or at 404/881-3506.

The Florida Department of Environmental Regulation has been requested to certify the discharge(s) in accordnace with the provisions of Section 401 of the Clean Water Act (33 U.S.C. Section 1251 et seq.). Comments of issuance of certification must be submitted to the state agency address above within thirty (30) days of the date of this public notice. The state agency will co-chair the hearing in order to receive comments relative to state certification.

Copies of the Draft EIS can be obtained from Mr. John E. Hagan, III at the EPA address above. Copies of the Draft EIS, which includes the draft NPDES permit and Permit Rationale are available for review at the following locations:

Crystal River Public Library 668 N. W. First Avenue	City of Crystal River
Inverness Public Library 108 N. Seminole	Inverness
Homosassa Public Library	Homosassa Springs
Yankeetown Public Library	Yankeetown
Lake-Sumter Community College Library Highway 411	Leesburg
City Library, City Hall	Bronson
Hernando Public Library	Hernando
Ocala Public Library 15 S.E. Osceola	Ocala
Gainesville Public Library 220 E. University Avenue	Gainesville
Dunnellon Public Library	Dunnellon
St. Petersburg Public Library 3745 9th Avenue, N.	St. Petersburg
St. Petersburg Municipal Reference Library, 175 5th Street, N.	St. Petersburg
Tampa-Hillsborough County Public Library, 900 N. Ashley	Tampa
Tampa College Library 2501 W. Kennedy Boulevard	Tampa

Please bring the foregoing to the attention of persons who you know will be interested in this matter.

United States
Environmental Protection
Agency

Region 4
345 Courtland Street, NE
Atlanta, GA 30308

EPA 904/9-80-048
July 1980

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Environmental Impact Statement

Draft

Florida Power Corporation Crystal River Units 4 and 5

i.a

EPA 904/9-80-048
NPDES Application Number:
FL 0036366

Draft
Environmental Impact Statement

for
Proposed Issuance of a New Source National
Pollutant Discharge Elimination System Permit

to
Florida Power Corporation
Crystal River Units 4&5
Citrus County, Florida

U.S. Environmental Protection Agency
Region IV, Atlanta, Georgia 30365

Florida Power Corporation proposes to construct and operate two 695 MW (gross) capacity coal-fired electric generating plants at the existing Crystal River complex in northwest Citrus County, Florida. This EIS examines project alternatives, impacts, and mitigative measures related to groundwater, air, surface water, ecological, and socioeconomic and cultural systems.

Comments will be received until NOV 1 0 1980
Comments or inquiries should be directed to:

John E. Hagan, III
Chief, EIS Branch
U.S. Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365
(404) 881-7458

Approved by

Rebecca W. Hanmer — AUG 1 1980

Rebecca W. Hanmer
Regional Administrator

Date

Summary Sheet for Environmental

Impact Statement

Crystal River Units 4 & 5
Florida Power Corporation

(X) Draft
( ) Final

U.S. Environmental Protection Agency, Region IV
345 Courtland Street, N. E.
Atlanta, Georgia 30365

1. Type of Action: Administrative (X) Legislative ( )

2. Description of Action

Florida Power Corporation (FPC) is proposing to construct and operate two 695 MW (gross) capacity coal-fired steam electric generating plants at the existing Crystal River complex in Citrus County, Florida. The EPA Region IV Administrator has declared this proposed action to be a new source as defined by Section 306 of the Clean Water Act. Operation of Crystal River Units 4 & 5 will require a National Pollutant Discharge Elimination System (NPDES) permit. The issuance of this permit is a major Federal action significantly affecting the quality of the human environment. In compliance with EPA responsibilities under the National Environmental Policy Act (NEPA) an Environmental Impact Statement (EIS) has been prepared.

As a public utility Florida Power Corporation (FPC) is obligated to efficiently provide adequate electric power to its service area customers. Florida Power Corporation has conducted an evaluation of its ability to fulfill future electric power commitments and has determined the addition of two generating units is essential to meeting projected future demands.

The Governor and Cabinet of the State of Florida in November 1978, approved a Certification Order on an application for Power Plant Site Certification submitted by FPC for Crystal

River Units 4 & 5. Testimony and reports entered in the certification hearings by the Florida Public Service Commission show that operation of Units 4 & 5 as planned (1982 and 1984) is essential to avoid extremely low generating reserve margins and unacceptably high loss of load probability. Without these units FPC would not be able to meet its responsibilities to the Florida peninsular grid, and generation planning flexibility for the State of Florida would be substantially reduced.

The proposed Crystal River Units 4 & 5 are to be located on approximately 335 cleared acres at FPC's 4738 acre Crystal River complex in Citrus County, Florida. The complex is located adjacent to the Gulf of Mexico and between Crystal River to the south and Withlacoochee River to the north. The City of Crystal River is approximately 8 miles southeast of the complex. Currently FPC operates 3 existing generating units (a 383 MW coal unit, a 498 MW coal unit, and an 825 MW nuclear unit) at the complex on approximately 319 cleared acres. The proposed Units 4 & 5 are to be constructed north of the existing units and will be operational for 30 years.

Major components of the proposed project include two 695 MW (gross) electric generating plants, two 440 feet tall natural draft salt water cooling towers, two 600 feet tall chimneys, a wastewater treatment system, a coal storage area, and a residuals disposal area. Approximately 335 acres will be cleared to construct the plants and supportive facilities.

The project as proposed by FPC calls for expansion of the existing coal handling facilities. Additional coal storage area will be located adjacent to Units 4 & 5. The existing barge and rail loading facilities are adequate to provide the support for the proposed expansion. A 50/50 blend of Appalachian and western coal is proposed to be used in Units 4 & 5.

Make-up cooling water for the proposed units will be drawn from an intake structure in the existing discharge canal for Units 1, 2 & 3. An average of approximately 98 million gallons per day will be required for operation of Units 4 & 5. An average of 0.6 million gallons per day of raw groundwater will be required for plant freshwater uses. A well field located along the FPC central Florida transmission line corridor will provide the source of freshwater.

Cooling tower blowdown of approximately 88 million gallons per day will be discharged into the existing discharge canal downstream of the intake structure. Other wastewaters generated at the facility will be segregated as appropriate and directed to a multi-component waste treatment and disposal system. No discharge of these wastewaters to surface waters is proposed as evaporation and exfiltration will exceed wastewater influent flow.

An average of approximately 1,730,000 pounds of residuals will be disposed of daily in a 95 acre, 40 feet deep onsite storage area. These residuals will include dewatered bottom ash, pulverizer rejects, fly ash, economizer ash, and gas recirculation ash. FPC is attempting to find a market for the fly ash. Runoff from the residuals storage area, from the coal pile and from the plant site will be settled in two systems of canals and ponds having a detention volume which exceeds the ten-year, 24-hour rainfall event. Normally this detention system will have no discharge to surface waters due to evaporation and exfiltration. However, stormwater runoff which exceeds the detention volume will overflow to the existing discharge canal.

Air emissions will be controlled by boiler design to 0.7 pound NO_x/million BTU, by electrostatic precipitators to 0.1 pound particulates/million BTU, and by low sulfur coal to 1.2 pounds SO_2/million BTU. The design content of the coal is approximately 0.49%. Particulates generated through coal and ash handling are proposed to be controlled by bag filter units for enclosed structures and by wetting agents for open areas.

Transmission line expansion will be limited to the Crystal River complex. No additional offsite transmission facilities are proposed.

3. Major Alternatives Considered

A. Management alternatives including purchases of power, reactivating and uprating older units, and joint projects were considered. Alternatives were evaluated primarily with regard to meeting projected FPC demands. As evidenced in the site certification proceedings, the addition of the proposed Units 4 & 5 is essential to meeting generating responsibilities and to maintain an acceptable loss of load probability for the Florida peninsular grid.

B. Energy source alternatives including nuclear, oil, gas, coal, hydroelectric, and solar sources were evaluated. Major consideration was directed toward the state of the art of these technologies, fuel availability, application to the siting region, and construction time constraints. The proposed coal fired units were selected as desirable based on environmental considerations (in conjunction with siting alternatives), available technology, national fuel use policies, and engineering, licensing, and construction lead times. Hydroelectric facilities are not appropriate to the State of Florida, the Powerplant and Industrial Fuel Act of 1978 generally prohibits the use of petroleum as the fuel source for power plants, and nuclear based generating plants require extremely long lead times for licensing and construction.

C. Siting alternatives were evaluated to assess the suitability of 11 prime sites for location of two 695 MW units. These 11 sites were selected for further evaluation after screening the potential sites which had initially been identified. Siting evaluations indicate that integrating the proposed engineering strategy with the facilities and resources at the Crystal River site is environmentally preferable to locating a power plant at an unindustrialized site.

D. Plant locations at the proposed complex were evaluated to minimize loss to the ecological systems and to utilize existing facilities as fully as possible. Three sites were considered.

E. Cooling system alternatives were evaluated considering environmental and economic factors. Cooling systems considered included once-through cooling, natural draft wet cooling towers, mechanical draft wet cooling towers, dry and wet-dry towers, and power spray modules.

F. Water source and intake alternatives were evaluated in conjunction with possible cooling system alternatives. Evaluation included quantity/quality parameters, potential entrainment/impingement factors, and economics of water transport. Alternatives evaluated included freshwater sources (Crystal River, Lake Rousseau, Withlacoochee River, groundwater) and salt water sources (Gulf of Mexico, Withlacoochee Reach of the Cross-Florida Barge Canal, saline groundwater).

G. Wastewater treatment and discharge systems were evaluated to assess meeting regulatory requirements and to maximize reuse of water.

H. Air emissions control system alternatives were evaluated considering the state of the art of emission control technology, environmental impacts, and economics. Sulfur dioxide (SO_2) control alternatives evaluated included use of low sulfur coal, coal beneficiation, and flue-gas desulfurization. Particulate control alternatives evaluated included use of wet scrubbers, fabric filters, mechanical separators, and electrostatic precipitators. Nitrogen oxides (NO_x) control alternatives evaluated included application of various combustion technology strategies. FPC submitted a Prevention of Significant Deterioration (PSD) permit application in 1977 and subsequent to review received a PSD permit in 1978. Under provisions of the Clean Air Act in effect in 1977 FPC was able to elect to use low sulfur coal instead of installing SO_2 scrubbers.

I. Residual waste disposal alternatives were evaluated primarily in conjunction with coal type strategies and air emission controls. Alternatives considered included marketing of fly ash, pond disposal, mine disposal, ocean disposal, and landfill disposal. Evaluation focused on leachate formation and contamination of ground and surface water.

J. Transmission line alternatives were evaluated in conjunction with locating the units at the existing complex. No offsite transmission corridors are proposed.

K. A no-action alternative was evaluated to consider the effects and implications of not constructing Units 4 & 5.

4. Summary of Major Environmental Impacts

The project is an integration of elements from each group of system alternatives (water source, cooling system, wastewater treatment, fuel, air emissions control, residual waste disposal). Once elements of the project were identified, the environmental impacts of this collective action were assessed.

Primary emphasis of this assessment focused on identifying potential impacts and determining means to minimize adverse impacts.

The direct effect of constructing the proposed units and attendant facilities will be the loss of 335 acres of vegetation at the plant site. Major terrestrial systems affected include 148 acres of slashpine flatwoods, 62 acres of mesic hammock, and 55 acres of hydric hammock. Additionally, 25 acres of freshwater marsh and 6 acres of coastal hydric hammock will be affected. As a result wildlife in these areas will be forced to relocate or morelikely will be lost. Because of the high transmissivity of the underlying aquifer a reduction in the freshwater subsidy of nearby wetland areas is unlikely. Early in the planning stage the proposed plant location was shifted eastward to avoid major areas of coastal salt marsh, coastal hydric hammock, and hydric hammock.

Approximately 160 cubic yards of material will be dredged from the existing discharge canal during placement of the intake and discharge structures. This activity will increase turbidity and mineralization in the discharge canal. These construction activities will require less than one month for completion. The Corps of Engineers is preparing to issue a dredge and fill permit for construction of the intake and discharge structures pending EPA's completion of the environmental review process.

Stormwater runoff will be increased during construction due to disruption of the existing vegetative cover and soil structure. The potential for soil erosion will increase during construction. Detention ponds, dikes, and use of mulch and sod will be utilized to control soil loss. No point source discharge to waters of the United States will result if these measures are utilized.

Air quality will be affected principally by fugitive dust (particulates) during heavy construction activities. Water, oil, and dust suppression controls will be utilized to minimize impacts. Additional air quality impacts can be expected from on-site burning and vehicle emissions.

Acoustics impacts associated with construction are anticipated to be minimal since the nearest noise sensitive area is 5 miles distant. Impacts to the socioeconomic system include increased vehicular traffic and the effects of a transient labor population particularly on rental housing in the surrounding area. Other public facilities (hospitals, services, schools) appear adequate.

Major operational impacts will affect surface water, ground water, air and land resources.

Groundwater withdrawal will average 0.6 million gallons per day. Maximum withdrawal will be 3 million gallons per day resulting in an immediate area drawdown of 2.5 feet and a drawdown of 1.75 feet at the property boundary. Biological communities associated with freshwater marshes in the cone of depression could be affected by groundwater withdrawal.

Impacts to the groundwater regime could occur in the form of leachate from the residuals disposal area, coal pile, and plant drains collection pond. The primary constituents of leachate would include acidity, iron, manganese, other trace metals, and dissolved solids. Movement of leachate would be toward the Gulf of Mexico due to natural groundwater flow. Mitigative measures including lining of the residuals area are currently being evaluated as part of a leachate testing and monitoring program.

An average of 98 million gallons per day of water from the existing discharge canal will be required as cooling water make-up for the proposed units. Impingement impacts are anticipated to be minimal for several reasons: the manmade discharge canal offers only one outlet (the Gulf outlet), the canal's fish population is predominantly that of larger - more mobile species, the intake velocity and volume are lower than that of Units 1, 2, & 3, and the canal current is seaward. Entrainment impacts resulting from Units 4 & 5 are also anticipated to be minimal primarily since most water withdrawn will already have been entrained by Units 1, 2 & 3.

Cooling system blowdown for Units 4 & 5 will be discharged to the existing discharge canal during normal load conditions at 61,100 gallons per minute and during peak load conditions at 56,700 gallons per minute. Blowdown will include chlorine and thermal discharge and will be in compliance with provisions of the NPDES permit. Thermal loading is predicted to increase winter temperatures in the discharge canal 1.5° F above the increases resulting from Units 1, 2, and 3 and to decrease summer temperatures. The discharge canal will continue to be influenced by the existing Units 1, 2, & 3 and as a consequence impacts from Units 4 & 5 should be negligible.

Other process wastewaters will be routed through a wastewater treatment system to a plant drains collection pond. No discharge from this pond will be permitted. Runoff from the residuals disposal area, coal piles, and plant site will be settled in two systems of canals and ponds having a detention volume which exceeds the ten-year, 24-hour rainfall event. Discharge of these wastes to surface waters is not anticipated because evaporation and exfiltration rates will exceed influent rates. However, stormwater runoff which exceeds the detention volume will overflow to the existing discharge canal.

Principal atmospheric emissions from the proposed facility will be nitrogen oxides (NO_x), particulates, and sulfur dioxide (SO_2). Disperson of these emissions will be assisted by use of 600 feet tall chimneys. A Prevention of Significant Deterioration (PSD) review has been conducted for this project. PSD analysis indicated that air quality changes in the surrounding Class II area and at the Chassahowitska National Wilderness Area (a Class I area) forty miles distant will be within allowable PSD increment levels. Based on this analysis, state and federal air quality standards will not be violated. Fugitive dust emissions from the coal handling and residuals disposal area will be controlled through use of wetting agents in open areas and bag filters in enclosed areas. Negligible effects on local air quality are anticipated. Extensive investigations are currently in progress toward understanding of the globally significant acid rain problem. Sulfur dioxide emissions from Units 4 & 5 will potentially contribute to this phenomenon. The PSD permit requires that SO_2 emissions from Crystal River Units 1 & 2 be reduced from approximately 4.5 lb SO_2/million BTU to no greater than 2.1 lb SO_2/million BTU as Units 4 & 5 become operational. The long term effect on acid rain production is unknown.

Modeling indicates a potential for fogging approximately 344 hours each year. Again, based on modeling this impact will be highly localized to the immediate plant area and of relatively brief duration.

Salt drift originating from the natural draft cooling towers will be deposited over the surrounding area and could impact nearby vegetation. A monitoring program will be initiated prior to commencement of plant operation to assess potential impacts.

Barge traffic associated with transport of coal will traverse waters known to be within the range of the Florida manatee, an endangered species. Additionally, manatees are known to congregate at the intake canal during spring and fall movements. The U.S. Fish and Wildlife Service (USFWS) of the Department of the Interior rendered a biological opinion stating these activities will likely jeopardize the continued existence of the manatee. The draft NPDES permit, Part III conditions require that mitigative measures as expressed by the USFWS in their biological opinion be implemented to avoid impacts to the manatee.

Operation of Units 4 & 5 will generate considerable residual wastes that must be disposed. The proposed onsite landfill that will be utilized to dispose of these wastes represents a long-term commitment of this land and reduces the potential future uses of the land.

Operational impacts on the socioeconomics of the area are generally considered beneficial. Operation of Units 4 & 5 will require 162 workers. The direct economic effects will yield approximately $3,400,000 in annual payroll, $300,000 annually for contractural services, and about $5,200,000 annually in property tax. The proposed facility is compatible with current area land use plans. No occupied residences are located within four miles of the complex. The existing public, medical, recreational, and cultural facilities within the surrounding area will not be significantly impacted. Because of the remoteness of the site no noise impacts will be noted.

5. Coordination List

The following Federal, State, and Local agencies and interest groups have been requested to comment on this impact statement:

Federal Agencies

Bureau of Outdoor Recreation

Coast Guard
Corps of Engineers

Council on Environmental Quality
Department of Agriculture
Department of Commerce

Department of Education
Department of Energy
Department of Health and Human Services
Department of Housing and Urban Development
Department of the Interior
Department of Transportation

Economic Development Administration
Federal Energy Commission
Federal Highway Administration
Federal Power Commission
Fish and Wildlife Service
Food and Drug Administration.
Forest Service
Geological Survey
National Park Service

Nuclear Regulatory Commission.
Soil Conservation Service
Federal Aviation Administration

Members of Congress

Honorable Lawton Chiles
United States Senate

Honorable Don Fugua
U.S. House of Representatives

Honorable Richard Kelly
U.S. House of Representatives

Honorable Richard Stone
United States Senate

Honorable Sam Gibbons
U.S. House of Representatives

Honorable C. W. (Bill) Young
U.S. House of Representatives

State

Honorable D. Robert Graham
Governor
Coastal Coordinating Council
Department of Agriculture
Department of Commerce
Department of Community Affairs
Department of Environmental Regulation
Department of Health and Rehabilitation Services
Department of Natural Resources
Department of the State
Department of Transportation
Geological Survey
Game and Freshwater Fish Commission

Local

Southwest Florida Water Management District
Withlacoochee Regional Planning Council
Citrus County Commission
Levy County Commission
Hernando County Commission
City of Crystal River
City of Yankeetown

Interest Groups

Florida Audubon Society
Florida Sierra Club
Izaac Walton League of America
Gulf Coast Lung Association
Florida Defenders of the Environment
Florida Wildlife Federation

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FLORIDA POWER CORPORATION
CRYSTAL RIVER UNITS 4 AND 5

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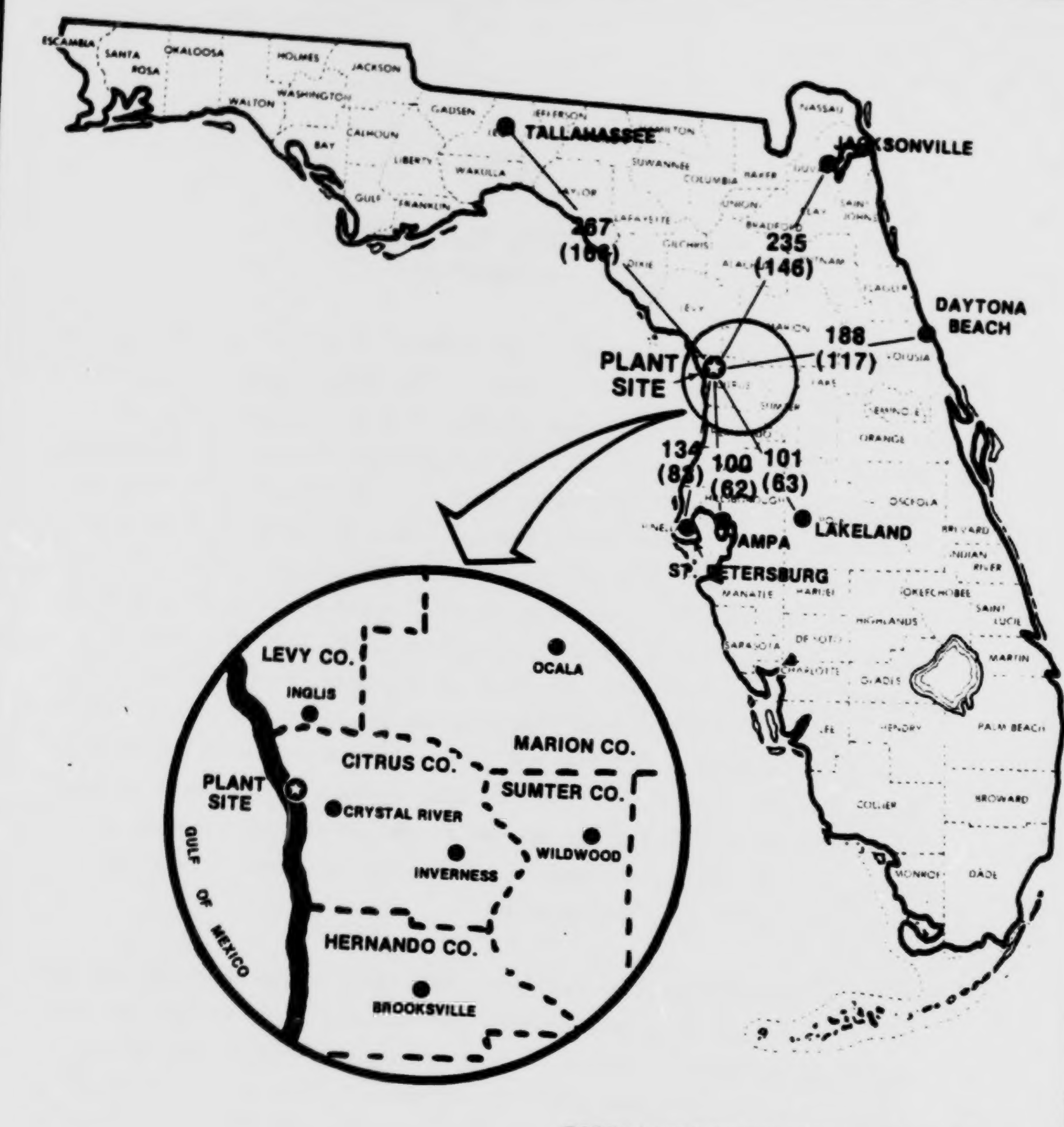
CHAPTER I

PROJECT BACKGROUND

INTRODUCTION

Florida Power Corporation of St. Petersburg, Florida, is proposing to construct and operate two 695 Megawatt (Mw) gross capacity electric generating facilities in Citrus County, Florida, near the City of Crystal River (see Figure 1). The two proposed facilities will occupy part of an established generating site where Florida Power currently owns and operates three power plants, Crystal River Units 1, 2, and 3, and their associated production and transmission facilities. The two new power plants will be known as Crystal River Units 4 and 5 and are planned for commercial operation in October 1982 and April 1984, respectively. Information presented in the Need for Power section of this document indicates that the proposed Crystal River Units 4 and 5 represent important, although not the only, components of the Florida Power electric generation expansion plan through 1985. Based on this plan, Florida Power requires the additional generating capacity of these units in order to provide adequate and reliable electric power to customers within its service area.

The U.S. Environmental Protection Agency (EPA) has determined that the water discharges from the proposed facilities will be subject to the National Pollutant Discharge Elimination System (NPDES) new source effluent limitations and permit requirements. As a prerequisite to granting the required new source NPDES permits, the EPA is required by the National Environmental Policy Act of 1969 (NEPA) to evaluate all potential environmental impacts of the proposed project. In order to fulfill NEPA requirements, this Draft Environmental Impact Statement (DEIS) has been prepared and will be reviewed by local, state, and federal agencies and by concerned individuals and public interest groups. During the public comment period and at the public hearing, comments on


TALLAHASSEE
JACKSONVILLE
DAYTONA BEACH
PLANT SITE
267 (166)
235 (146)
188 (117)
134 (83)
100 (62)
101 (63)
TAMPA
LAKELAND
ST. PETERSBURG
ESCAMBIA
SANTA ROSA
OKALOOSA
HOLMES
JACKSON
WALTON
WASHINGTON
GADSEN
JEFFERSON
CALHOUN
BAY
LIBERTY
WAKULLA
GULF
FRANKLIN
SUWANNEE
COLUMBIA
BAKER
NASSAU
UNION
BRADFORD
LAFAYETTE
GILCHRIST
DIXIE
ALACHUA
LEVY
MARION
VOLUSIA
LAKE
SUMTER
SEMINOLE
ORANGE
OSCEOLA
BREVARD
INDIAN RIVER
MANATEE
HARDEE
OKEECHOBEE
SAINT LUCIE
HIGHLANDS
SARASOTA
DE SOTO
CHARLOTTE
GLADES
MARTIN
LEE
HENDRY
PALM BEACH
COLLIER
BROWARD
MONROE
DADE
LEVY CO.
INGLIS
OCALA
MARION CO.
CITRUS CO.
PLANT SITE
CRYSTAL RIVER
SUMTER CO.
INVERNESS
WILDWOOD
GULF OF MEXICO
HERNANDO CO.
BROOKSVILLE

DISTANCES IN KILOMETERS (MILES)

Figure 1
SITE LOCATION

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1977

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

the environmental effects of the two facilities and on the EPA action of issuing the NPDES permits will be received. After the comment period is closed, a Final Environmental Impact Statement (FEIS) will be prepared which will respond to the comments and present EPA's decision regarding the issuance of the permits to operate the two proposed 695 Mw power plants and their associated facilities.

The DEIS consists of this summary document plus technical support documents. This volume describes the proposed project, including its need and practical alternatives, and identifies its expected effects on the natural and social environment. The technical support documents include more details of the information gathered during the permitting process and are used as a reference for the more simplified explanation contained in this summary document.

Pursuant to regulations implementing the provisions of the NEPA, this DEIS was prepared within a third party consultant procedure. Under this procedure, the permit applicant, Florida Power Corporation, engaged and retained an independent, third party consultant to prepare the plan of study, DEIS, and technical support documents under EPA supervision. Florida Power nominated Environmental Science and Engineering, Inc. (ESE) of Gainesville, Florida, to serve as the third party consultant. Prior to commencing work on the DEIS, an objectivity and qualifications statement of ESE was submitted to EPA and circulated by EPA to interested agencies and other parties for comment. The purpose of this statement was to assure maximum objectivity on the part of ESE in the required environmental data collections and analyses and in the preparation of the DEIS. After the comments were reviewed and the objectivity criteria satisfied, EPA, Region IV approved ESE to serve as the third party consultant and prepare this DEIS and its supporting documents. All work completed by ESE and contained in this DEIS and the supporting documents was reviewed, approved, and modified where appropriate by EPA prior to its publication. During this review process, Florida Power Corporation and federal agencies provided comments for consideration by the EPA.

In addition to EPA's approval and issuance of NPDES permits, Florida Power is required to obtain governmental approval from the State of Florida. Pursuant to the Florida Power Plant Siting Act, Chapter 403 Florida Statutes, Florida Power is required to file an Application for Certification of a Proposed Fossil Fuel Electrical Power Generating Plant Site (commonly referred to as a Site Certification Application) with the Florida Department of Environmental Regulation (FDER) and obtain approval of this application before starting construction of the proposed project. Prior to the issuance of a site certification, the FDER is required to assess the potential effects upon the environment and ecology by the proposed plant in order to insure that the construction and operation of the plant will be consistent with public policy and legislative intent. This requirement supersedes all other state regulations and permits in regard to proposed power plants and their sites and, in effect, combines the state government approval processes into a single, comprehensive procedure. The Site Certification Application is reviewed by the FDER and provided to other state and local agencies and to concerned individuals and public interest groups for comment. As in the NEPA process, a public hearing and responses to comments are required before the FDER will make its final recommendation to the Governor concerning the certification of the proposed project. State hearings have been held, and approval for the project has been granted by the Governor and by the Cabinet.

Because of the similarity in the information required, Florida Power requested and received approval from EPA to have the third party consultant, ESE, prepare the Site Certification Application and the DEIS concurrently. As a result, much of the text of the technical support documents was prepared concurrently with the state site certification. Also, in an effort to minimize duplication of document production efforts, EPA approved the basic format and contents of the site certification application as the detailed technical information which is used to prepare the DEIS. However, since EPA has sole responsibility for the technical content and environmental assessments contained in the

DEIS, ESE has been requested by EPA to provide some additional information and clarifications beyond the Site Certification Application information and to perform analyses for independent verification of certain information contained in the application. Thus, the DEIS contains additional information not contained in the site certification.

The DEIS is divided into eight chapters plus the Summary which preceded this chapter and an appendix which contains specific permit information. In order to assist readers of this DEIS in referencing the more detailed information contained in the technical support documents, the following chart lists the chapters of this DEIS and the appropriate technical support document chapters from which the DEIS information was primarily obtained.

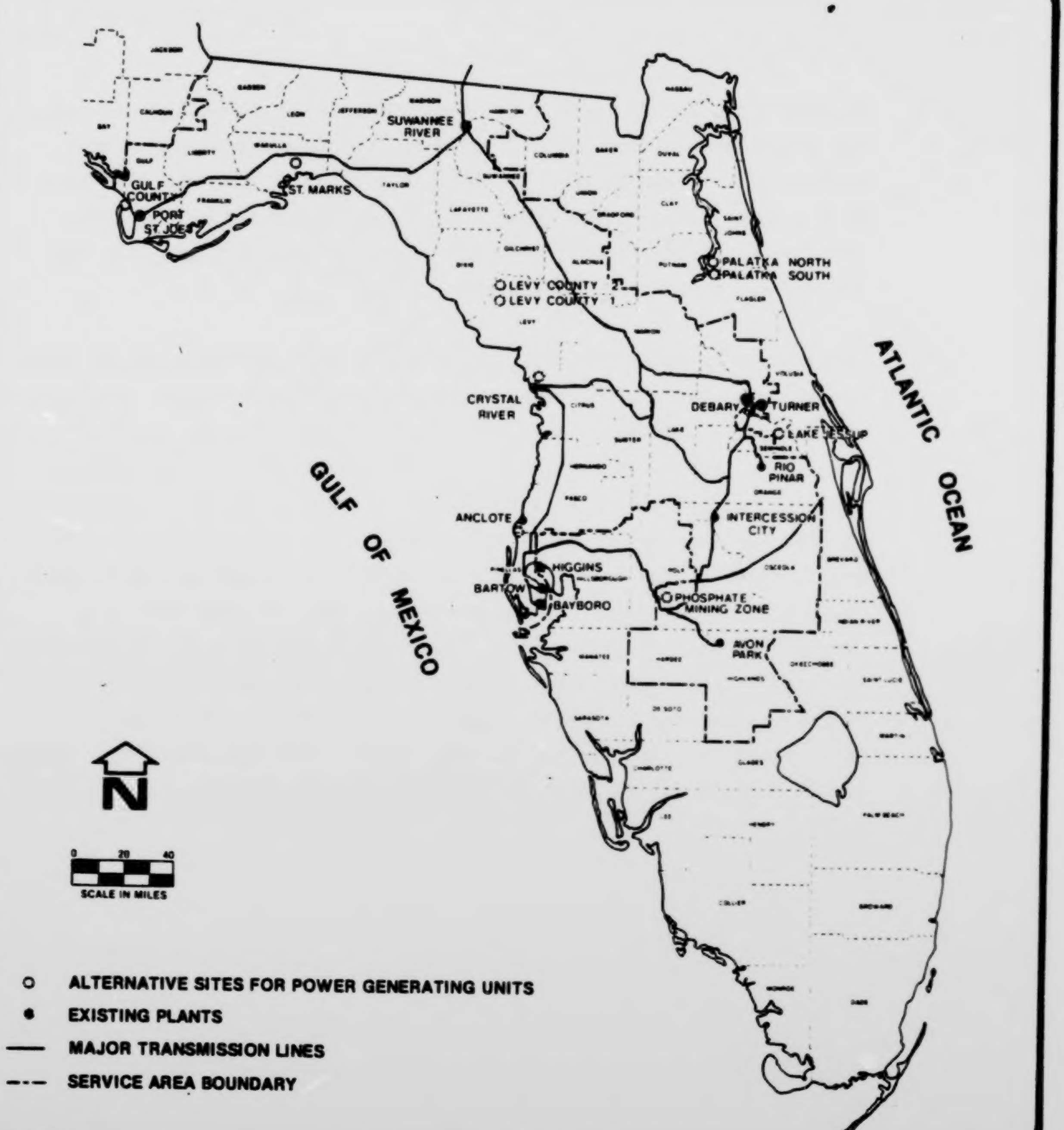
DEIS Chapter	Technical Support Document Chapter
Action Summary Statement	All Chapters
Chapter I, Project Background	Chapter 1
Chapter II, Available Alternatives	Chapters 8 and 9
Chapter III, Detailed Description of the Project Area	Chapter 2
Chapter IV, Detailed Description of the Proposed Project	Chapter 3
Chapter V, Environmental Impacts of the Proposed Project	Chapters 4, 5, and 7
Chapter VI, Available Mitigative Measures	Chapters 4, 5, and 6

COMPANY, SERVICE, AND SYSTEM DESCRIPTION

Florida Power Corporation is an investor-owned company which has generated, distributed, and sold electricity in Florida since 1909. The company service area presently comprises approximately 20,600 square miles in the west-central portion of the Florida Peninsula and in the eastern half of the Florida Panhandle and covers the total area or portions of 32 of the 67 counties in the state (see Figure 2). This area contained an estimated population of 2.9 million persons as of July 1, 1977.

As of December 31, 1977, Florida Power served a total of 689,834 retail or ultimate user customers and 422 wholesale accounts or sales for re-sale customers. Of the retail customers, 620,045 were residential customers which accounted for 40.0 percent of the kilowatt-hour sales of the company in 1977. The 1,075 industrial customers of Florida Power in 1977 accounted for 17.7 percent of the kilowatt-hour sales with seven of the ten largest industrial customers involved in phosphate mining and chemical processing activities. The wholesale or sales for re-sale accounts consist of municipally operated electric utilities, rural electric cooperatives, and other investor-owned utilities and accounted for 19.6 percent of the company's energy sales in 1977. Between December 1968 and December 1977, the total number of customers served by Florida Power increased by 68.7 percent while kilowatt-hour sales increased by 126.4 percent over the same 10-year period, primarily due to increased sales in the residential category.

As of December 31, 1977, the total net generating capacity of the Florida Power system was 4,120 Mw in the summer and 4,452 Mw in the winter. The system was comprised of twelve generating stations which included fourteen heavy oil fired steam units, one coal fired steam unit, one


SUWANNEE RIVER
GULF COUNTY
PORT ST. JOE
ST. MARKS
LEVY COUNTY 2
LEVY COUNTY 1
PALATKA NORTH
PALATKA SOUTH
ATLANTIC OCEAN
CRYSTAL RIVER
DEBARY
TURNER
LAKE JESSUP
RIO PINAR
GULF OF MEXICO
ANCLOTE
INTERCESSION CITY
HIGGINS
BARTOW
BAYBORO
PHOSPHATE MINING ZONE
AVON PARK
N
0
20
40
SCALE IN MILES

○ ALTERNATIVE SITES FOR POWER GENERATING UNITS

● EXISTING PLANTS

— MAJOR TRANSMISSION LINES

-·- SERVICE AREA BOUNDARY

Figure 2
FLORIDA POWER SERVICE AREA

SOURCE: FLORIDA POWER CORPORATION, 1972
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1978

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

nuclear unit, twenty light oil combustion turbine units, and six heavy oil combustion turbine units. Based on net winter capacities, the system capacity mix by fuel and generation type at year-end 1977 was: 40.6 percent fossil steam-heavy oil; 9.7 percent fossil steam-coal; 16.4 percent nuclear; 26.3 percent combustion turbine-light oil; and 7.0 percent combustion turbine-heavy oil.

Aside from its installed capacity, Florida Power has transmission interconnections and interchange agreements with several electric utilities to purchase or exchange power for emergency, maintenance, or other purposes on an as-available basis. All of the Florida Power generating capacity, including transmission system, is connected to the Peninsular Florida Electric Power Grid system. Within the grid system, Florida Power currently has various types of power interchange agreements with Tampa Electric Company, Florida Power and Light, Orlando Utilities Commission, City of Gainesville, City of Sebring, City of Kissimmee-St. Cloud, City of Tallahassee, City of Lakeland, and the Southern Company. Over the past five years the net power purchased and interchange received by Florida Power under these agreements have ranged from 1,703,416 kilowatt hours in 1973 to 559,353 kilowatt hours in 1977.

PROJECT OBJECTIVES

The government of the State of Florida, under which the Florida Power Corporation operates as a public utility, requires the corporation to supply adequate electric power to fill the residential, industrial, and commercial demands of customers within its service area. Adequate electric power service implies several specific, but related, obligations on the part of Florida Power. To provide adequate service, Florida Power is specifically obligated to provide electric power in amounts that meet the demands of its customers, to meet sufficient system reliability standards that minimize loss or interruptions in service, and to maintain the highest practicable efficiency or the lowest costs in providing its services based on economic considerations for both its customers and its stockholders.

In addition to present electric power services and demands, Florida Power is obligated to provide adequate service to meet future demands of its customers. Due to the long lead times associated with the planning, permitting, and construction of generating units (i.e., ten years for conventional fossil fuel units, and ten to twelve years for nuclear units), an electric utility must anticipate the future power requirements of its customers and make commitments for providing the necessary generating capacity well in advance of the time when the increased power requirements occur.

To fulfill its basic obligations, Florida Power has carefully evaluated the future requirements of its customers in relation to its present system generating capacity and to historical and anticipated trends in electric usage. Based on these evaluations, Florida Power has developed a generation expansion plan for its system through 1988 which will meet its forecasted requirements. This plan is comprised of a mixture of base load generation, combined cycle mid-range type generation, and simple cycle combustion turbine generation, as well as the retirement of several older units because they are obsolete, relatively inefficient to operate, or costly to maintain. In addition, the expansion plan includes firm capacity purchases from other utilities which are presently contracted or under negotiation. The Florida Power planning process also considered the possibility of further firm capacity purchases from other utilities and joint-ownership of future generating units planned by other utilities.

After consideration and evaluation of these various ways to obtain additional generating capacity in order to meet its future demand requirements and maintain reliable service, Florida Power has determined that a key component of its expansion plans is the addition of two, base load, generating facilities to its system to begin service in 1982 and 1984. To this end, Florida Power is proposing to construct and operate two 695 Mw gross capacity generating facilities near Crystal River in Citrus County, Florida. The primary objective for these new facilities is to provide additional generating capacity to the Florida Power system in order to meet the future power requirements of its customers and to maintain sufficient system reliability through 1985.

NEED FOR ADDITIONAL POWER

FACTORS AFFECTING DEMAND

The historical growth in energy demands is influenced by a variety of factors. Analyses of the relationship between historical trends and these influencing factors provide valuable information for determining future energy demand growth. However, consideration of historical trends and relationships are of only partial value in forecasting demands, since the factors affecting demand are variable over time. Such a variation was recently experienced in 1974 when the average kilowatt-hour consumption per residential customer abruptly decreased by about 15 percent. Therefore, after historical trends are evaluated, the next step in forecasting energy demand is to identify the factors affecting demand and to arrive at a set of assumptions concerning the effect of the factors on future demand.

Florida Power carefully evaluated the historical growth of its demand and developed the following set of assumptions upon which its forecasts of energy use are based:

1. Normal weather conditions will prevail.
2. The economy of the service area will continue to improve at a slow, steady rate.
3. No significant loss of energy sales to solar energy will occur until the late 1980's.
4. Personal income will increase at a rate equal to or greater than the Consumer Price Index (CPI); rate increases, if any, will be equal to or less than the CPI. No effects of rate increases will be included in the forecast.
5. Florida Power will continue to serve all of the wholesale load which they now serve as well as the energy required for the

load growth of the existing wholesale customers, except the load and energy responsibility which will be assumed by Seminole Electric Cooperative, Inc.

6. Unavailability of fossil fuels will cause an increase in use of electricity for space heating.
7. The population projections made by the Bureau of Economic and Business Research of the University of Florida in Population Studies, Bulletin No. 41, July, 1977, are reasonably accurate.
8. There will be no impact of load management reflected in the forecast.
9. Improvements in insulation levels and equipment efficiency and increased emphasis on conservation will result in reduced sales beginning in the mid-1980's.

FORECAST METHODS

The following discussion summarizes the methods used by Florida Power to forecast energy demand or use by customer category. More complete information is provided in Chapter 1 of the technical support documents, entitled "Purpose of the Proposed Facility and Associated Transmission."

A statistical equation based on population figures published by the Bureau of Economic and Business Research, University of Florida, was used to forecast residential customers. A similar regression of average annual residential customers and average annual commercial customers was used as a basis for the commercial customers forecast. The remaining classes of customers represent a very small portion of the total and were forecast using historical trends.

Residential sales were forecast based on annual kilowatt-hour consumption per customer. This indicator was forecast by two different methods, and the results were compared for consistency. The first method was a projection based on past trends, with some judgment of the effects of future events applied rather than using strictly rigorous mathematical methods. The second method was based upon sales to a "typical" residential customer, and was broken down by type of appliance such as air conditioning, heating, refrigeration, water heating, etc. The usage for each appliance was combined with projections of appliance saturation to produce a forecast of kilowatt-hour sales per customer. The usage per appliance was based on in-house load research conducted over past years, when available, and on Edison Electric Institute published data when in-house data were not available. The kilowatt-hour sales per customer obtained by these two methods were then compared to produce a final estimate.

Commercial kilowatt-hour sales were also estimated by two different methods. Historical growth rates of total commercial sales were used to make projections of future growth rates. Sales figures obtained in this manner were compared to figures obtained by projecting historical kilowatt-hour sales per customer for future years and necessary adjustments made to form the final forecast. Sales to the industrial and street and highway lighting classes are obtained by projections of historical growth rates.

Sales of electricity to those who are reselling power were forecast in two categories--Rural Electrification Administration (REA) power cooperatives, and municipalities. In past years, sales to the REA category have been statistically related to the sales to the residential category. The final prediction of sales to REA's is a result of the regression equation tempered by judgment, because the REA's serve the more rural areas and therefore have greater potential for growth. In addition, since Seminole Electric Cooperative, Inc. has announced plans to build two 600-Mw units in the mid-1980's and to take responsibility for its own load, the Florida Power resale class demands were appropriately reduced to reflect this load take over. By 1986 and each year thereafter, the Florida Power share of the Seminole Electric load was assumed to be zero.

Sales to the municipal class have historically followed total sales, excluding the sales to municipals. Using logic similar to that used for the REA sales, the municipal utilities serve in areas that are somewhat restricted, and therefore sales to this category are limited to the later years of the forecast.

FORECASTED DEMANDS

After total sales and total average annual customer forecasts had been determined, annual kilowatt-hour sales per customer were calculated. Statistical equations, based on annual kilowatt-hour sales per customer and kilowatt demand per customer, were used to determine the seasonal demand forecast. The annual load factor was then calculated to check the forecast for reasonableness.

These computations resulted in a complete forecast which included sales and demand of all wholesale load. However, several of the wholesale customers now own part of Crystal River Unit 3. The demand forecast was adjusted to account for this ownership by subtracting 33 Mw.

Table 1 presents the Florida Power yearly forecasts of energy use by customer class and Table 2 shows the forecast of seasonal demands. Table 3 presents a summary of Florida Power customer growth rates and energy sales or use growth rates for the historical and projection periods and Figure 3 shows similar information for peak demands.

SYSTEM CAPACITY AND RESERVE MARGINS

Florida Power Corporation used two computer programs in the process of planning generation capacity. These two programs were the Production Costing and Reliability Model known as PROMOD and the Corporate Model.

PROMOD is a reliability program that calculates the loss of load probability (LOLP). LOLP is the probability that load will exceed capacity of a particular proposed generation system and serves as a measure of system reliability based on a specific criteria. PROMOD was used to

Table 1. Florida Power Corporation Forecast of Energy Use, 1980-1997

	Rural & Residential				Commercial		Industrial	
Year	Gwh	Average No. of Customers	Average Kwh Consumption Per Customer	FPC % Increase*	Gwh	Average No. of Customers	Gwh	Average No. of Customers
1980	7,473	671,556	11,128	2.3	4,416	68,388	3,317	1,800
1981	7,904	692,844	11,408	2.5	4,703	69,888	3,516	1,872
1982	8,330	713,424	11,676	2.3	5,003	71,364	3,722	1,944
1983	8,736	734,100	11,900	1.9	5,242	72,800	3,939	2,000
1984	9,136	755,000	12,101	1.7	5,465	74,300	4,164	2,050
1985	9,531	774,900	12,300	1.6	5,666	75,800	4,401	2,100
1986	9,935	794,800	12,500	1.6	5,856	77,300	4,639	2,150
1987	10,298	814,100	12,650	1.2	6,036	78,800	4,871	2,200
1988	10,661	832,900	12,800	1.2	6,207	80,300	5,100	2,250
1989	10,979	851,100	12,900	0.8	6,364	81,700	5,319	2,300
1990	11,280	867,700	13,000	0.8	6,523	83,100	5,505	2,350
1991	11,549	881,600	13,100	0.8	6,676	84,400	5,670	2,400
1992	11,818	895,300	13,200	0.8	6,813	85,700	5,811	2,450
1993	12,086	908,700	13,300	0.8	6,943	86,900	5,945	2,500
1994	12,354	921,900	13,400	0.8	7,070	88,100	6,070	2,550
1995	12,627	935,300	13,500	0.7	7,198	89,300	6,191	2,600
1996	12,856	948,800	13,550	0.4	7,330	90,600	6,315	2,650
1997	13,066	962,500	13,575	0.2	7,453	91,900	6,441	2,700

* Percent (%) increase of average KWH consumption per customer

Table 1. Florida Power Corporation Forecast of Energy Use, 1980-1997 (Continued, Page 2 of 2)

Year	Street and Highway Lighting Gwh	Other Sales to Ultimate Consumers Gwh	Total Sales to Ultimate Consumers Gwh	Sales for Resale Gwh	Utility Use, Losses, Billing Lag Gwh	Net Energy for Load Gwh	Percent Change (%)
1980	117	513	15,836	3,561	1,693	21,090	6.5
1981	124	560	16,807	3,810	1,794	22,411	6.3
1982	132	605	17,792	4,057	1,892	23,741	5.9
1983	141	648	18,706	3,288	1,811	23,805	0.3
1984	150	687	19,602	2,810	1,935	24,347	2.3
1985	161	721	20,480	2,398	1,924	24,802	1.9
1986	172	750	21,352	2,004	2,000	25,356	2.2
1987	180	777	22,162	2,087	2,071	26,320	3.8
1988	188	800	22,956	2,165	2,140	27,261	3.6
1989	196	822	23,680	2,237	2,201	28,118	3.1
1990	204	841	24,353	2,302	2,257	28,912	2.8
1991	211	859	24,965	2,360	2,308	29,633	2.5
1992	217	876	25,535	2,414	2,359	30,308	2.3
1993	224	894	26,092	2,467	2,407	31,066	2.5
1994	230	912	26,636	2,519	2,454	31,609	1.7
1995	236	930	27,182	2,570	2,500	32,252	2.0
1996	242	948	27,691	2,616	2,545	32,852	1.9
1997	247	967	28,174	2,655	2,589	33,418	1.7

Source: Florida Power Corporation, 1978.

Table 2. Florida Power Corporation Forecast of Seasonal Demands, 1980-1997

Year	Summer Peak Demand		Year	Winter Peak Demand	
	Net Mw	Percent Change (%)		Net Mw	Percent Change (%)
1980	4,190	6.1	1980-81	5,050	6.3
1981	4,440	5.6	1981-82	5,360	6.1
1982	4,710	6.1	1982-83	5,660	5.6
1983	4,750	0.8	1983-84	5,760	1.8
1984	4,950	4.2	1984-85	6,050	5.0
1985	5,030	1.6	1985-86	6,140	1.5
1986	5,160	2.6	1986-87	6,310	2.8
1987	5,380	4.3	1987-88	6,580	4.3
1988	5,500	2.2	1988-89	6,730	2.3
1989	5,590	1.6	1989-90	6,860	1.9
1990	5,770	3.2	1990-91	7,080	3.2
1991	5,740	-0.5	1991-92	7,090	0.1
1992	5,900	2.8	1992-93	7,290	2.8
1993	5,850	-0.8	1993-94	7,290	---
1994	6,010	2.7	1994-95	7,490	2.7
1995	6,060	0.8	1995-96	7,580	1.2
1996	6,200	2.3	1996-97	7,770	2.5
1997	6,340	2.3	1997-98	7,930	2.1

Source: Florida Power Corporation, 1978.

Table 3. Florida Power Corporation Customer Growth Rates and Sales Growth Rates

CUSTOMER GROWTH RATES*
(%)

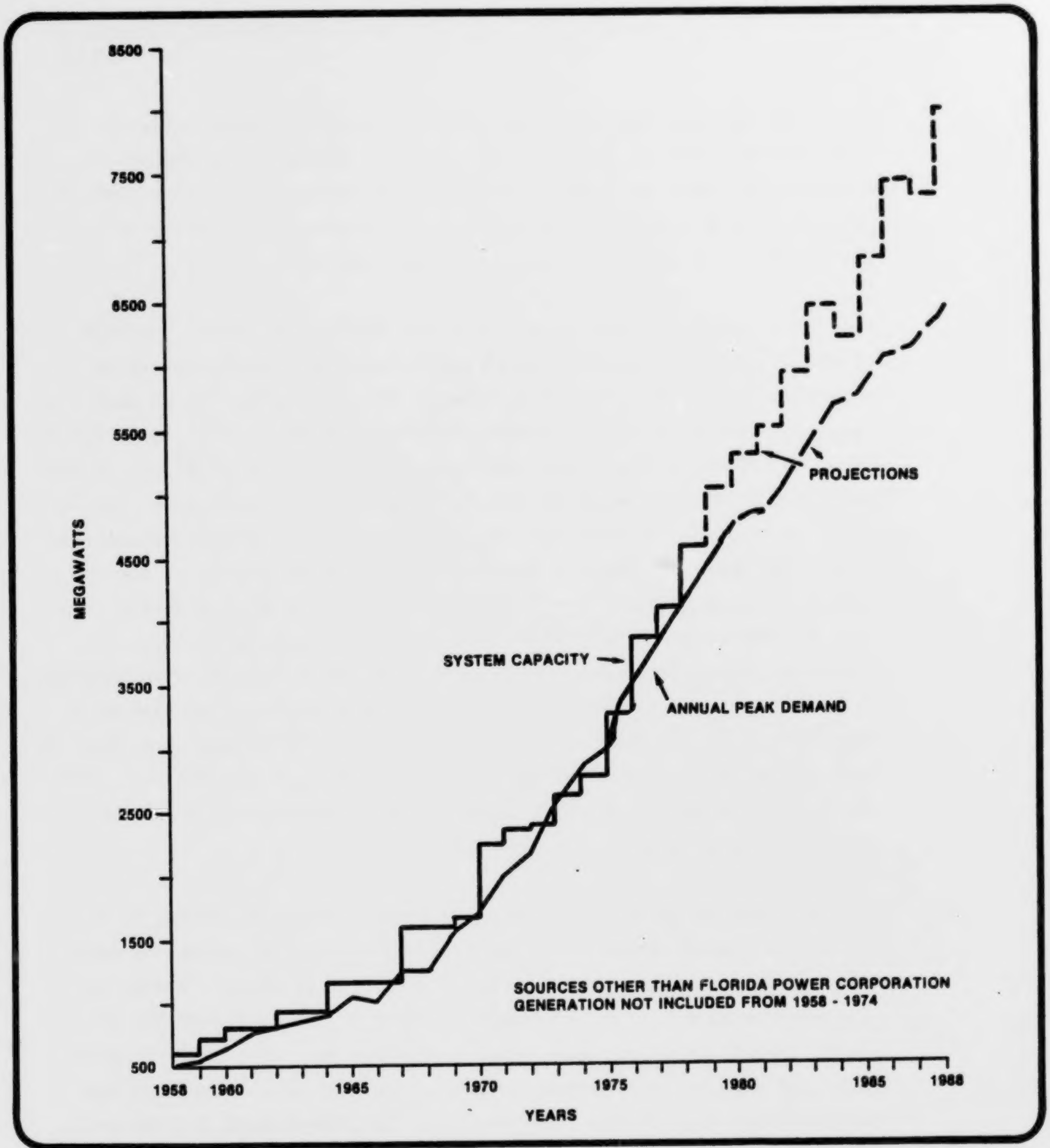
	1957-1967	1967-1977	1977-1987	1987-1997	1977-1997
Residential	5.41	6.23	3.08	1.69	2.36
Total	5.20	6.14	2.99	1.68	2.32

SALES GROWTH RATES*
(%)

	1957-1967	1967-1977	1977-1987	1987-1997	1977-1997
Residential	12.64	11.41	4.91	2.41	3.54
Commercial	13.48	11.16	5.52	2.31	3.70
Industrial	10.53	5.78	5.64	2.83	4.31
Total (before Seminole adjustment)	11.30	10.31	5.59	2.56	3.97
Total (after Seminole adjustment)	N/A	N/A	4.29	2.43	3.26

*Growth rates are computed as compound annual percent changes.
N/A--Not applicable.

Source: Florida Power Corporation, 1978.



SOURCES OTHER THAN FLORIDA POWER CORPORATION GENERATION NOT INCLUDED FROM 1958 - 1974

Figure 3
HISTORICAL AND PREDICTED PEAK DEMANDS AND AVAILABLE GENERATION CAPACITY OF FLORIDA POWER CORPORATION 1958 - 1988

SOURCE: FLORIDA POWER CORPORATION, 1980.

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calculate the LOLP for each year; and if the predetermined criteria for LOLP were exceeded in any year, the program calculated the amount of capacity that must be added in order to meet the criteria. The LOLP was calculated from a forecast of hourly peak demands and projected forced outage rates and scheduled outages for each generating unit.

One of the most important inputs into the PROMOD program was the LOLP criteria. A LOLP of one day in 10 years has been generally accepted throughout the electric utility industry as a reasonable design goal, and these criteria were used at Florida Power Corporation. This means there would be, on the average, one day in 10 years during which Florida Power would not be able to serve all of its firm load. For generation capacity planning purposes, a criterion of 2.5 days per year including dependency upon interruptible loads and interconnections is equivalent to the one day in 10 years LOLP for firm loads. After the PROMOD program had been used to determine the quantity and timing of required generation additions, expansion plans were developed for each reasonable combination of potential capacity additions. In order to evaluate these alternate expansion plans on a basis of equal reliability, PROMOD was used again to test and adjust each plan so that they do yield equal reliability. For the Florida Power system, a 15 percent reserve generating margin is comparable to an LOLP of 2.5 days per year.

The next step in generation capacity planning was to determine, from a production costing standpoint, the cost to operate the system for each alternative expansion plan. The Production Costing Model, PROMOD, is also used to make this determination. Major inputs to PROMOD are an hourly demand and energy load model, estimated unit availability, heat rates and expected maintenance schedules for each unit, projected fuel cost for each type of fuel, and expected firm interchange information. Based on this information, PROMOD was used to determine the cost to operate the system for each alternate expansion plan.

This production costing information along with a capital cost estimate of each alternate plan and kilowatt-hour sales forecast was input into the Corporate Model, which is a computer model of the financial operation of the company. The Corporate Model was used to determine the overall cost to the customer for each of the alternate expansion plans. The expansion plan that produced an acceptable system reliability at the lowest overall cost to the customer and still maintained a fair rate of return to the stockholder was selected for future implementation.

The proposed generation expansion plan of Florida Power and projected reserves are presented in Table 4.

Tables 5, 6, 7, and Figures 4 and 5 are based upon the proposed generation expansion plan and demonstrate the effects of adding one 695-Mw gross capacity coal unit in 1982, and another in 1984, or not adding either unit on the Florida Power system and on the peninsula of Florida. As evident from the generation expansion plan, the addition of these two 695-Mw coal units is an important part of the overall Florida Power expansion plan through 1985. However, these units represent only one-half of the required capacity additions during the time period 1978 through 1985. The remaining additional capacity required would be furnished by Anclote 2, 250-Mw combustion turbines, 300-Mw combined cycle, and purchases of firm capacity from neighboring utilities.

As can be seen from the tables and figures, Florida Power's reserves and LOLP have unacceptable values (more than 2.5 days per year) without the additional capacity provided by the two proposed units or by some other firm capacity source or combination of sources.

Table 4. Florida Power Corporation Generation Expansion Plan

Year	Generating Capacity †	Additions (Mw)		Date	Reserves (%)
1980	5,275	50	Crystal River 2 (ID Fan)	4/79	11.1
		130	Purchase (Tallahassee)	4/79- 3/80	
		*130	Purchase (Orlando)	11/79-10/80	
1981	5,530	150	Combustion Turbines	10/80	9.5
		150	Purchase (Gainesville)	1/81-12/83	
		100	Purchase (Tallahassee)	4/80- 3/81	
		*115	Purchase (Orlando)	11/80-10/81	
1982	5,985	300	Combined Cycle	10/81	11.7
		*200	Purchase (Lakeland)	10/81-11/82	
		* 90	Purchase (Orlando)	11/81-10/82	
		80	Purchase (Tallahassee)	4/81- 3/82	
1983	6,485	640	Coal (Crystal River 4)	10/82	14.6
		*170	Purchase (Lakeland)	12/82-11/83	
		60	Purchase (Tallahassee)	4/82- 3/83	
1984	6,235	100	Combustion Turbines	10/83	8.2
		30	Purchase (Tallahassee)	4/83- 3/84	
1985	6,845	640	Coal (Crystal River 5)	4/84	
1986	7,441	640	Coal Unit	10/85	21.2
		(44)	Avon Park 2 Retired		
1987	7,374	(67)	Suwannee 1, 2 Retired	6/86	
1988	8,014	640	Coal Unit	10/87	

* Contracts presently under negotiation.

† Generating capacity at time of winter peak is calculated as follows: For generating capacity 1981, 5,530 MW is obtained by subtracting the 130 Mw Tallahassee purchase, which expires 3/80 and the 130 MW Orlando purchase, which expires 10/80, from the generating capacity of 5,275 MW and then adding 150 MW combustion turbines, 150 MW Gainesville purchase, 100 MW Tallahassee purchase, and 115 MW Orlando purchase.

Source: Florida Power Corporation, 1978.

Table 5. Capacity, Demands, and Reserves for Peninsular Florida and Florida Power Corporation (With Both Proposed Units Included)

Year	Capacity		Winter † Peak Demand		Reserves				FPC LOLP Days/Year
					State		FPC		
	State	FPC *	State	FPC	Mw	%	Mw	%	
1980	24,483	5,275	19,598	4,750	4,885	24.9	525	11.1	3.1
1981	26,270	5,530	20,769	5,050	5,501	26.5	480	9.5	3.1
1982	26,910	5,985	21,895	5,360	5,015	22.9	625	11.7	2.3
1983	29,015	6,485	22,996	5,660	6,019	26.2	825	14.6	2.8
1984	28,401	6,235	24,082	5,760	4,319	17.9	475	8.2	1.7
1985	31,412	6,845	25,232	6,050	6,180	24.5	795	13.1	1.5
1986	31,934	7,441	26,390	6,140	5,544	21.0	1,301	21.2	0.7
1987	33,374	7,374	27,592	6,310	5,782	21.0	1,064	16.9	1.3

* FPC capacity includes firm power purchases where applicable and is that value of capacity in the month of January for each respective year.

† Winter peak is assumed to occur in January of each year.

Source: Florida Power Corporation, 1978.

Table 6. Capacity, Demands, and Reserves for Peninsular Florida and Florida Power Corporation (With Crystal River 4 Omitted and Crystal River 5 Included)

Year	Capacity		Winter † Peak Demand		Reserves				FPC LOLP Days/Year
					State		FPC		
	State	FPC *	State	FPC	Mw	%	Mw	%	
1980	24,483	5,275	19,598	4,750	4,885	24.9	525	11.1	3.1
1981	26,270	5,530	20,769	5,050	5,501	26.5	480	9.5	3.1
1982	26,910	5,985	21,895	5,360	5,015	22.9	625	11.7	2.9
1983	28,375	5,845	22,996	5,660	5,379	23.4	185	3.3	9.0
1984	27,761	5,595	24,082	5,760	3,679	15.3	-165	-2.85	5.6
1985	30,772	6,205	25,232	6,050	5,540	22.0	155	2.55	5.3
1986	31,294	6,801	26,390	6,140	4,904	18.6	661	10.8	2.9
1987	32,734	6,734	27,592	6,310	5,142	18.6	424	6.7	4.7

* FPC capacity includes firm power purchases where applicable and is that value of capacity in the month of January for each respective year.

† Winter peak is assumed to occur in January of each year.

Source: Florida Power Corporation, 1978.

Table 7. Capacity, Demands, and Reserves for Peninsular Florida and Florida Power Corporation (With Crystal River 4 and Crystal River 5 Omitted)

Year	Capacity		Winter † Peak Demand		Reserves				FPC LOLP Days/Year
					State		FPC		
	State	FPC *	State	FPC	Mw	%	Mw	%	
1980	24,483	5,275	19,598	4,750	4,885	24.9	525	11.1	3.1
1981	26,270	5,530	20,769	5,050	5,501	26.5	480	9.5	3.1
1982	26,910	5,985	21,895	5,360	5,015	22.9	625	11.7	2.9
1983	28,375	5,845	22,996	5,660	5,379	23.4	185	3.3	9.0
1984	27,761	5,595	24,082	5,760	3,679	15.3	-165	-2.9	12.2
1985	30,132	5,565	25,232	6,050	4,900	19.4	-485	-8.0	13.8
1986	30,654	6,161	26,390	6,140	4,264	16.2	21	0.3	9.1
1987	32,094	6,094	27,592	6,310	4,502	16.3	-216	-3.4	14.1

* FPC capacity includes firm power purchases where applicable and is that value of capacity in the month of January for each respective year.

† Winter peak is assumed to occur in January of each year.

Source: Florida Power Corporation, 1978.

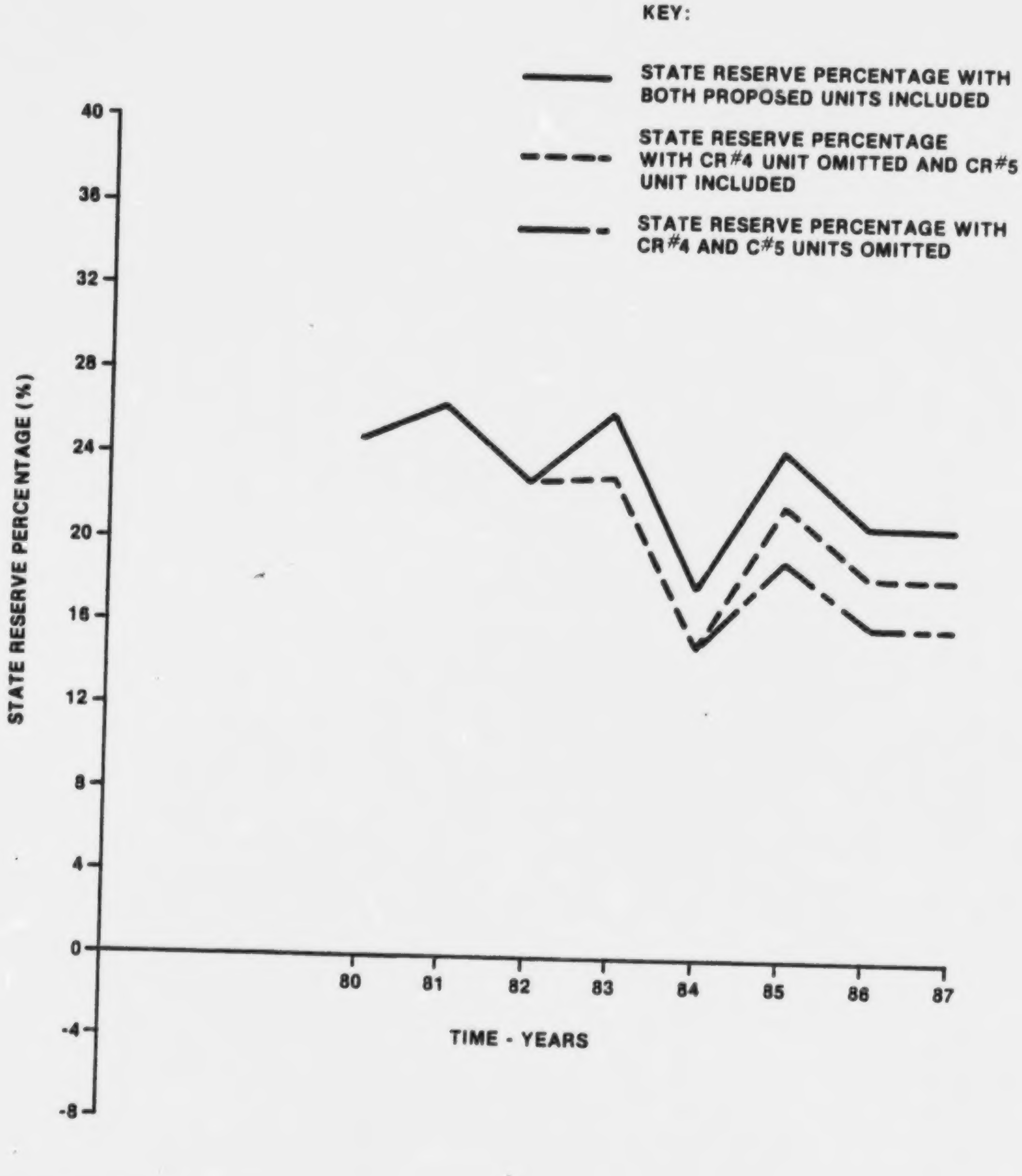

Figure 4
PENINSULAR FLORIDA PERCENT RESERVES

SOURCE: FLORIDA POWER CORPORATION, 1978

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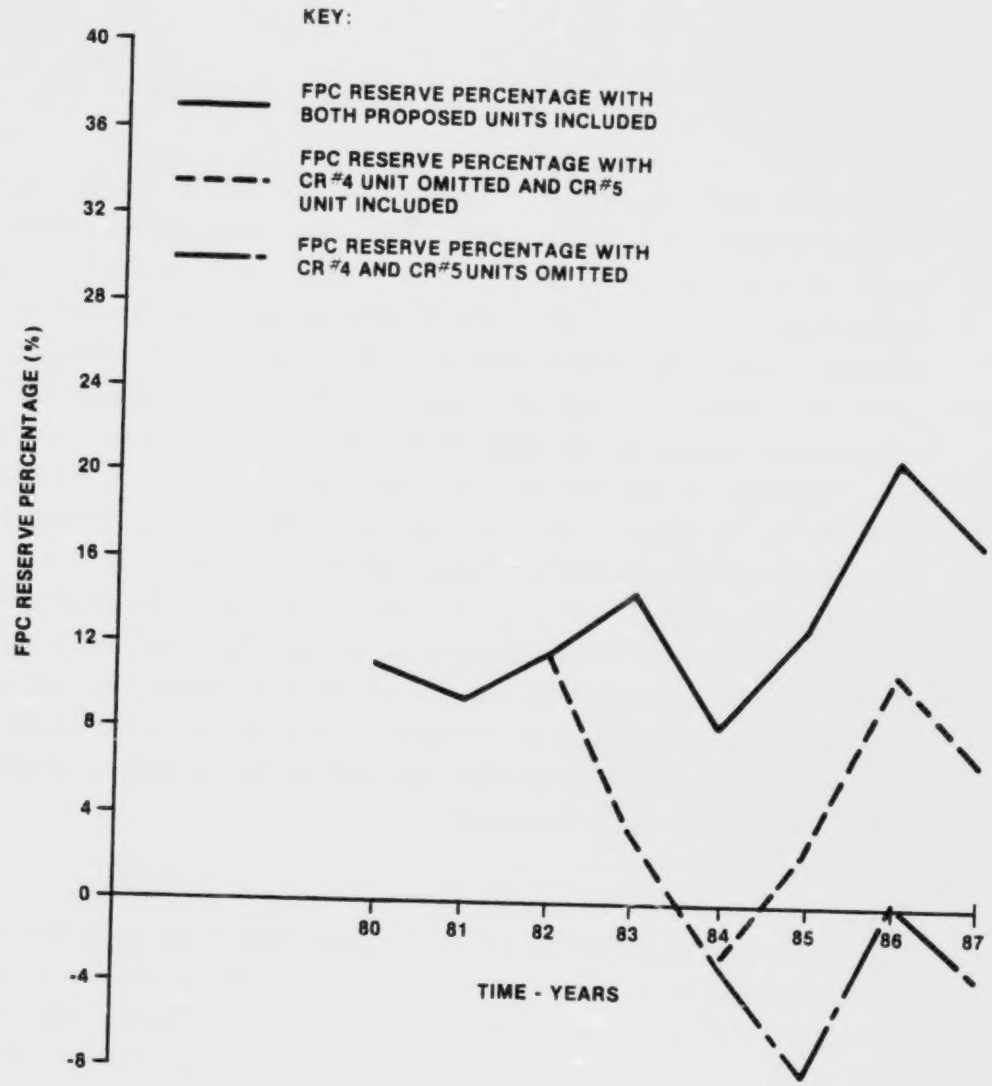

Figure 5
FLORIDA POWER CORPORATION PERCENT RESERVES

SOURCE: FLORIDA POWER CORPORATION, 1978.

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CITRUS COUNTY, FLORIDA

NEED FOR PROJECT

In order to meet its obligation as a public utility to provide adequate service to meet the future demands of its customers, Florida Power conducted detailed analyses to determine its future customer growth, energy demands, and available system capacity and reserves and to develop a generation expansion plan to meet its addition capacity needs. Based on historical trends in customer growth and energy use, and on assumptions concerning the various factors affecting demand, Florida Power anticipates that its customers and system loads will continue to increase in the future. However, due to slowdowns in the growth of population and of the average energy use per customer as a result of conservation measures and appliance saturation, the forecasted growth rates are lower than those experienced in the 1960's and early 1970's. Florida Power forecasts that the net winter peak demand for its system can reasonably be expected to increase from 3,899 Mw in the winter of 1976 and 1977 to 6,580 Mw in 1987 and 1988 which represents a compound annual growth rate of 4.9 percent.

Using a method which calculates loss of load probability (LOLP), Florida Power evaluated alternative generation expansion plans in terms of system reliability. For generation capacity planning purposes, it has determined that a criterion of 2.5 days per year including dependency upon interruptible loads and interconnections is equivalent to an acceptable LOLP value of one day in 10 years for firm loads. This LOLP value indicates that a 15 percent reserve generating margin is adequate for the reliability of the Florida Power system. Florida Power also evaluated alternative expansion plans from the standpoint of production costs.

Based on these reliability and cost evaluations, Florida Power developed a generation expansion plan. Important components of this plan are the addition of two 695-Mw base load generating facilities to begin service in October 1982 and April 1984.

The need for these new facilities was further evaluated in respect to the effect on Florida Power and Peninsular Florida LOLP if one or the other were omitted or delayed. Firm capacity purchases from other utilities and potential joint-ownership of planned facilities of other utilities were also examined as possible alternatives to the new facilities. Based on these evaluations, Florida Power determined that the two 695-Mw (gross capacity) generating facilities as scheduled are needed to meet the accepted reliability goal of its system and that the cancellation or delay in either of the facilities would result in unacceptable reserve margins and increase the probability of blackouts and brownouts within the Florida Power service area.

CHAPTER II

AVAILABLE PROJECT ALTERNATIVES

MANAGEMENT ALTERNATIVES

NO PROJECT

The information required for evaluation of the no-project alternative has been presented in the earlier discussion of need for power. Total net energy use by Florida Power Corporation customers is projected to increase from 17,540 Gigawatt hours (Gwh) in 1977 to 26,320 Gwh in 1987, and 33,418 Gwh in 1997. The forecasts imply a compound rate of increase of 3.26 percent per year over the 20-year period (versus an annual rate of 9.69 percent during the years 1968 through 1977). Additional generating capacity has, therefore, been proposed to meet these demands and to maintain the reliability of the Florida Power system.

Future conditions without the addition of new capacity (or equivalent purchases of electricty from other utilities) have been analyzed in terms of percentage reserves and the Loss of Load Probability (LOLP) in days per year. As discussed previously, an acceptable design criterion is that there should be no more than 2.5 days' dependency upon interruptible loads and interconnections per year. Without the proposed generating unit schedule for completion in 1982, the LOLP would rise to between 5 and 9 days per year in 1983, 1984, and 1985. If the 1984 unit were also excluded, the LOLP would reach approximately 14 days per year. In both cases, the system would have negative reserve capacity by 1984. Thus, it is clear that the no-project alternative would threaten the ability of Florida Power to meet the energy needs of consumers in its service area.

PURCHASES OF REQUIRED ENERGY FROM OTHER SOURCES

Florida Power has long maintained a policy of participating in mutually advantageous power exchanges with other electric companies, and is currently negotiating or has firm purchase contracts with four municipal utilities. The importance of these purchases is indicated by the fact that in the winter of 1981-82, the capacity purchases from other utilities will equal the planned reserve capacity of the Florida Power system. However, it is very unlikely that additional purchases of the magnitude necessary to eliminate the proposed generating facilities would be feasible within the time frame required. The excess capacity in nearby utility service areas is limited, and without the proposed units by 1982 the reserves for peninsular Florida as a whole will be approaching the 15 percent level which is commonly considered minimal for maintenance of reliable service.

REACTIVATING AND/OR UPRATING OLDER PLANTS

Only limited benefits could be obtained by a program of uprating older plants or reactivating retired units. Existing turbines and generators can be uprated only by modest amounts, whereas reactivated equipment would be relatively unreliable and, therefore, unsuited for baseload generation. Replacement of the original equipment at existing sites would be constrained by technical factors and permitting requirements. Therefore, such steps would not be adequate to reduce LOLP and fulfill a major proportion of the demonstrated capacity needs.

JOINT PROJECTS

Florida Power has engaged in joint projects on a limited basis in the past, and is investigating the possibility of such a project in the post-1985 period. However, there are no opportunities for joint projects that would fulfill Florida Power's additional capacity needs in the years prior to 1985.

CONSTRUCTION OF SMALLER UNITS THAN THE PROPOSED FACILITIES

A small proportion of the new generating capacity required in the Florida Power service area by 1984 will be provided by combined cycle and simple cycle combustion-type generation. However, for system efficiency most of the additional capacity should be provided by larger baseload generation units. Three potential unit sizes have been considered by Florida Power (550 Mw, 600 Mw, and 640 Mw net electrical capacity), and the 640 Mw (net) 695 Mw (gross) size was selected on the basis of cost considerations. The possibility of siting two 695 Mw units at different locations was considered in some detail. This approach would present opportunities for minimizing transmission distances, but would require duplication of numerous support facilities such as access roads, solid waste disposal areas, coal handling systems, and water treatment facilities. Joint siting would also tend to minimize environmental impacts. Therefore, the site selection process assumed that the most viable option would be to construct two 640 Mw (net) 695 Mw (gross) units at the same location.

SITING ALTERNATIVES

CONSTRAINTS

The site selection process for the two 695 Mw power generating units proposed by Florida Power considered the entire state of Florida north of 27°00' North latitude and east of 85°30' West longitude. A series of site selection studies yielded a list of 185 potential sites, later reduced to 30 sites. The present discussion will refer only to the 11 sites which were identified as most promising in the final stages of the selection process. The locations of these sites are shown in Figure 6.

There are few highly favorable sites for power generation in Florida due to environmental constraints involving air quality, water supply, aquatic ecology, wildlife habitat, and existing patterns of land and water use. Numerous criteria have been applied in the screening of potential sites. These criteria are grouped into three categories: general siting criteria, engineering criteria, and environmental criteria.

Preliminary computations indicated that a minimum of 130 hectares (320 acres) of land would be needed to accommodate the proposed power generating units if cooling towers were utilized, versus approximately 730 hectares (1,800 acres) with cooling ponds. Potential land acquisition problems (for example, the need to acquire a large number of individual parcels) would be a negative factor, but land cost differentials generally were not a major factor in site comparisons. The other general site characteristics of major significance were the existence of flood hazards, the geologic suitability of the site for power plant construction, and access to transportation and power transmission facilities. Access to highway, rail, and waterway facilities were all

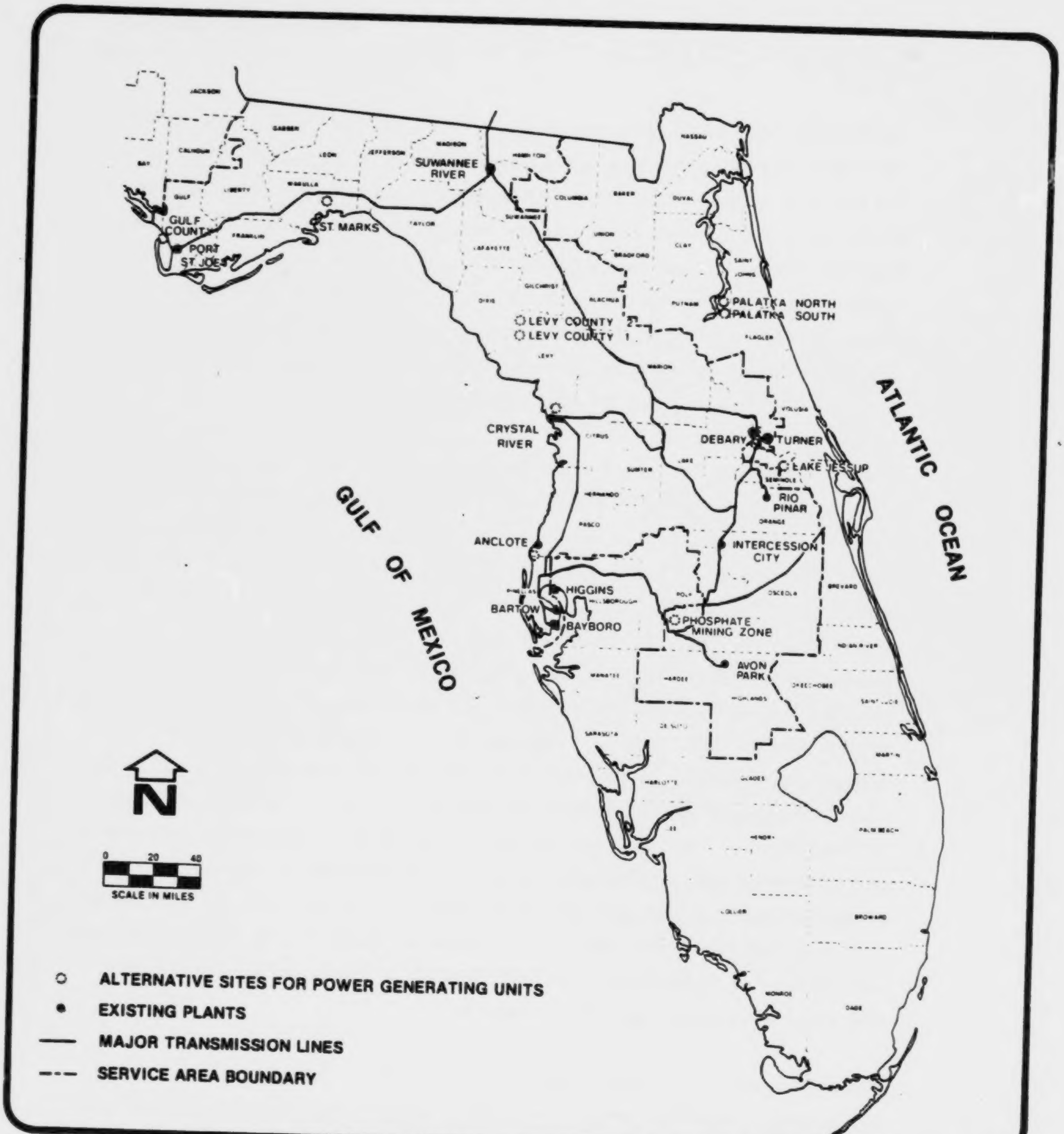
SUWANNEE RIVER
GULF COUNTY
PORT ST. JOE
ST. MARKS
LEVY COUNTY 2
LEVY COUNTY 1
PALATKA NORTH
PALATKA SOUTH
ATLANTIC OCEAN
CRYSTAL RIVER
DEBARY
TURNER
LAKE JESSUP
RIO PINAR
GULF OF MEXICO
ANCLOTE
INTERCESSION CITY
HIGGINS
BARTOW
BAYBORO
PHOSPHATE MINING ZONE
AVON PARK
N
0
20
40
SCALE IN MILES
○ ALTERNATIVE SITES FOR POWER GENERATING UNITS
● EXISTING PLANTS
— MAJOR TRANSMISSION LINES
-·- SERVICE AREA BOUNDARY

Figure 6
ALTERNATIVE SITES FOR POWER GENERATING UNITS

SOURCE: FLORIDA POWER CORPORATION, 1972
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1978

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considered important, although water access was not held to be an absolute necessity and was not among the factors included in quantitative cost comparisons. Regarding power transmission, the candidate sites were not limited to locations near Florida Power's existing transmission lines, but any new transmission or transportation corridors required as part of a site alternative were considered as integral elements of project cost and environmental impact. The line transmission losses involved in serving Florida Power customers from various sites were an important source of cost differentials.

The most important engineering siting criteria pertained to water supply and wastewater disposal. Based upon general engineering design criteria for two 695 Mw units, the required supply of cooling system make-up water was estimated at 76 million liters (20 million gallons) per day, assuming the operation of freshwater cooling towers at 5 cycles of concentration. Saltwater cooling towers would require substantially greater withdrawal. Other water uses could add as much as 11 million liters (3 million gallons) to the daily water requirement. A constraint on the use of river and lake systems was the state guideline that withdrawal rates should not exceed 5 percent of the minimum observed 30-day flow. Potential entrainment/impingement problems were also considered as constraints. In the case of site/plant alternatives requiring the use of ground water, the major issues were drawdown of the potentiometric surface and possible salt water intrusion. The evaluation of site alternatives with regard to wastewater focused upon the feasibility and expense of disposing residuals in such a manner as to comply with all applicable water quality standards.

The environmental criteria employed in the site selection process included air quality, water resources, aquatic and terrestrial ecology, population and land use, archaeological/historical sites, recreation resources, other socioeconomic considerations, and public safety. The most detailed criteria pertained to air and water resources since these involved quantitative standards established by federal and state agencies.

The federal air quality limitations affecting power plant locations include the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) regulations. A new fossil-fueled power plant must meet the emission limitation standards known as New Source Performance Standards, must not cause or contribute to violations of the NAAQS, and must not increase pollutant concentrations relative to baseline conditions by more than the allowable increments for the given area. The major air pollutants emitted from a fossil fuel steam electric power plant are suspended particulate matter, sulfur dioxide, and nitrogen dioxide. The State of Florida ambient air quality standards and limitations on significant deterioration are in most cases numerically equal to the corresponding federal standards.

The federal government and the State of Florida have promulgated extensive rules and regulations pertaining to the management of water resources in Florida. The water quality criteria established by state and federal agencies apply to approximately 40 chemical constituents plus thermal characteristics of receiving waters. The parameters of primary importance for power plants with cooling towers typically include total dissolved solids, temperature, and chlorine (from biocide use in cooling systems). Wastewaters from boiler wash, backwash, plant runoff, and runoff from storage and waste disposal areas may also contribute other contaminants.

The site selection criteria for aquatic and terrestrial ecosystems involved the following potential issues: entrapment of aquatic organisms by intake structures, detrimental effects of thermal discharges and wastewater effluents, disruption of terrestrial habitats by construction of power plant facilities and transmission or transportation corridors, off-site habitat effects due to noise, air quality degradation and cooling tower drift, and all factors affecting the existence of plant and animal species that are endangered or otherwise given special status. The criteria pertaining to population and land use were concerned with minimizing nuisances to the public such as noise and air quality impact. It was also considered important in site selection to avoid sensitive areas such as parks, archaeological/historical sites, wildlife refuges, areas of high natural productivity, and land and water bodies utilized intensively for recreation.

DESCRIPTION OF POTENTIAL SITES

GULF COUNTY

Florida Power Corporation has evaluated a number of potential sites near Port St. Joe in the Florida panhandle. The most favorable site is located on the south side of the Gulf County Canal near its confluence with the Intracoastal Waterway. A once-through cooling system utilizing water from the Intracoastal Waterway was considered by the utility for this site, although off-stream cooling would also be possible utilizing water from the canal system or a wellfield. The site has favorable roadway access, and coal barges could reach the site via the Gulf County Canal. Rail access could be provided by a 4-kilometer (2.5-mile) spur, but the existing rate structure in Florida would make this site relatively uneconomical to serve by rail.

Use of the Gulf County site would require extensive improvements to the existing power transmission system, and the line transmission losses during operation would be very substantial due to the distance of the site from Florida Power's load center (see Figure 6). The site is favorable or adequate in terms of topography, geology, existing vegetation, land ownership, and nearby land uses. However, the thermal and saline effluents from an open-cycle cooling power plant at this location could have serious effects on St. Joseph Bay, due to limited flushing, and there could be some air quality problems involving suspended particulate matter.

ST. MARKS

The St. Marks site is located in Wakulla County about 1.2 kilometers (0.7 mile) south of Newport and 3.2 kilometers (2 miles) northeast of St. Marks. The St. Marks River could be utilized for cooling, but there might be an undesirable degree of hydroperiod alteration. The site is favorable in terms of road and railway access. Barge access would require extensive dredging, however, and the site is relatively unfavorable in terms of electric power transmission losses. Other liabilities of the site include its location in a flood plain and its proximity to the St. Marks National Wildlife Refuge. The latter factor would relate significantly to water and air permitting.

LEVY COUNTY (2 SITES)

Florida Power has considered two potential power plant sites in Levy County, both located on the east bank of the Suwannee River. The sites are located north and south of Manatee State Park approximately 10 kilometers (6 miles) apart. The Suwannee River flow would be more than adequate for cooling purposes at either site. Road and rail access are moderately favorable at the northern site, but a rail spur of 32 kilometers (20 miles) would be required to access the southern property. Coal barges could reach either site via the Suwannee River, although the resulting increase in river traffic could constitute a significant environmental impact. The use of either site would require construction of a new power transmission corridor at least 40 kilometers (25 miles) in length.

Construction of power plant facilities at the southern site might entail destruction of some freshwater marsh, whereas the northern site lacks aquatic habitats. Suwannee River is used for sport fishing, commercial fishing, power boating, and water skiing, and has been proposed both as a state canoe trail and as a federal Wild and Scenic River. On the whole, the sites on the Suwannee River would be among the most sensitive in terms of possible public and governmental reaction, especially if the area is designated as a Wild and Scenic River. The sites would be among the most favorable for air quality permitting of power plant facilities.

CRYSTAL RIVER

The Crystal River property in Citrus County is owned by Florida Power, which operates three existing power plants at the site. All three existing units use once-through cooling with salt water. The available options for cooling at the proposed units would include: fresh water from wells drilled along the present power line rights-of-way, withdrawals of fresh water from Lake Rousseau (fed by the Withlacoochee River), and the use of sea water for once-through or off-stream cooling. The site is convenient in terms of existing highway and rail facilities, although an access road and rail spur would be required. Barge access and unloading facilities are already available at the site. No new power transmission corridors would be required, and the site is fairly well located relative to the load center of the Florida Power system. The Crystal River site is favorable in terms of nearby land use and public acceptance of new power generation facilities. However, air quality permitting could present some problems because of the emissions produced by existing facilities and the Class I air quality area status of the Chassahowitzka Wilderness Area which is located 21 kilometers (13 miles) south of the site.

ANCLOTE

The Anclote site is located in the extreme southwest portion of Pasco County on the north shore of the Anclote River estuary. Florida Power presently operates one oil-fired power generating facility at this site, and another will be on-line in the near future. A new power plant at the site would necessarily utilize either once-through cooling or salt-water cooling towers, and once-through cooling would probably not be acceptable in terms of impact on Anclote Anchorage. Barge access to the site is possible, but docking and unloading facilities would have to be constructed. The principal advantage of the Anclote site is its proximity to the Pinellas County load center and existing transmission facilities. The major disadvantages, in addition to water supply, are the limited land area available, the proximity of the site to existing urban development, and the possibility that new power generating facilities would contribute to air quality problems in the area.

PHOSPHATE MINING AREA

The site in question is the 4,500-hectare (11,000-acre) International Minerals Corporation property located 8 kilometers (5 miles) southwest of Bartow in the Polk County phosphate mining zone. This alternative has been conceived as a potential means of reusing two valuable resources: (1) an area of land that has been severely disrupted by mining; and (2) sanitary wastewater from the City of Tampa's sewage disposal plant at Hooker's Point. The wastewater would be pumped to the site via a 64-kilometer (40-mile) pipeline for use as cooling system makeup water.

Development of the phosphate mining site would involve little impact on terrestrial ecosystems, although the pipeline construction could have very significant effects. The site has very good highway and rail access, but no direct barge access. Its location is highly favorable with regard to future demands for power. Wastewater disposal at the site could present some problems, given the contaminants present in the sanitary effluent used for cooling, the nature of the river system draining the site (the Peace River), and the potential for groundwater pollution if percolation/evaporation ponds were utilized. Air quality would represent perhaps the most serious problem at the site, because of existing degradation related to the phosphate industry.

LAKE JESSUP

The Lake Jessup site is located in Seminole County on the southeastern shore of Lake Jessup about 19 kilometers (12 miles) northeast of Orlando. Power plant facilities at this site would utilize municipal wastewater from two City of Orlando sewage treatment plants for cooling system makeup, possibly supplemented by water from other sources. The site is moderately favorable in terms of highway and rail transportation, but barging of coal via Lake Jessup would probably not be feasible. The site is fairly well located relative to the load centers of the Florida Power service area. Disposal of wastewaters from a power plant at this site could pose significant problems. Existing land use is also a liability of the site. The land currently is owned by as many as 40 different individuals and is utilized intensively for agriculture (orange groves and truck farms). The surrounding area has a moderately high population density. On the other hand, the Lake Jessup site is as favorable as any other site in terms of air quality considerations.

DEBARY

The DeBary site is located on the east bank of the St. Johns River in Volusia County near the town of DeBary. Since 1976, Florida Power has operated a 336 Mw combustion turbine plant at the site, and more than 1,250 Mw of additional generating capacity is located in the vicinity. The DeBary site is favorable in terms of transportation since a rail line crosses the site and barge access is possible via the St. Johns River. The creation of barge traffic could involve significant impacts, however, given the intensive recreational use of the river. Disposal of wastewater into the river could be unacceptable for similar reasons. The DeBary site is well-situated relative to anticipated future power needs within Florida Power's service area, and no new transmission corridors would be required. A significant disadvantage of the site is that a substantial area is subject to flooding under extreme conditions.

Water supply could pose some problems at the DeBary site. Withdrawals from the St. Johns River could involve alteration of hydroperiod when defined in terms of the extreme low flows of record, although the requirement for cooling system makeup would only amount to about 1 percent of the long-term average discharge of the river. The site is only moderately favorable in terms of air quality, due to the existing power plants in the area.

PALATKA NORTH AND PALATKA SOUTH

Two sites in Putnam County near the City of Palatka have been considered in the final site evaluation, one about 8 kilometers (5 miles) northeast of Palatka and one approximately 5.6 kilometers (3.5 miles) southeast of the city. Both sites border the St. Johns River, and would have the advantage of allowing both barge transportation and relatively low-cost rail transportation from points outside Florida. A major disadvantage, however, is that the use of either site by Florida Power would require the construction of a transmission corridor exceeding 64 kilometers (40 miles) in length, plus possibly another shorter corridor. The St. Johns River has adequate flow in this vicinity for use as cooling system makeup water, although entrainment of aquatic life could pose problems. The possibility of water quality and thermal impacts as a result of wastewater discharges would also have to be studied carefully, given the present use of the St. Johns River for commercial and recreational fishing.

The Palatka North site consists primarily of a large dairy farm. A difficulty is that the nearby waterfront is lined with upper-income homes. The Palatka South site is primarily forested, but nine houses and a boat ramp presently exist on the site. Deep foundations would probably be required for construction of a power plant at this location. Air quality conditions would be relatively unfavorable for new power generating facilities at Palatka North, but somewhat better at Palatka South.

SELECTION OF PREFERRED ALTERNATIVE

The site selection process involved a screening of the 11 sites according to cost, followed by a final selection based primarily on environmental considerations. The costs of constructing and operating the proposed power generating units at each site were expressed on an annualized basis in increments relative to the Crystal River site. These figures are presented in Table 8. Thus, cost elements which did not involve differentials among sites were not considered. The major

Table 8. Comparative Costs for Power Plant Site Alternatives: Increment Costs Relative to Crystal River Site (Millions of Dollars)

	Transmission	Fuel Delivery	Cooling	Total
Gulf County	26	8-10	(10)	24-26
St. Marks	11-14	4-5	0	15-19
Levy County (2 sites)	7-9	0	0	7-9
Crystal River	0	0	0	0
Anclote	2	3-4	0	5-6
Phosphate Mining Zone	(3)	4-5	4	5-6
Lake Jessup	2	0	3-4	5-6
DeBary	0	0	0	0
Palatka North	9-10	(1-2)	0	7-9
Palatka South	8-9	(1)	0	7-9

Note: Numbers in parentheses are negative quantities.

Sources: Florida Power Corporation, 1977.
Environmental Science and Engineering, Inc., 1977.

cost categories were power transmission, fuel delivery, and cooling. The use of cooling towers was assumed for all sites except Gulf County, in which case once-through cooling was assumed. The only cost differentials associated with cooling were the relatively low cost at Gulf County and the relatively high costs at Lake Jessup and the phosphate mining site due to the importation of municipal wastewater. The transmission cost element covered both the required investment in new transmission facilities and the anticipated line transmission losses. The costs of fuel delivery were based on the use of rail transportation.

The outcome of the cost comparison, based on available data at the time, was a grouping of sites into four categories. The "unacceptable" category (with annual cost differentials of more than $15 million relative to Crystal River) contained the Gulf County and St. Marks sites. The two Levy County sites and the two sites near Palatka formed the "marginal" category (with annual cost differentials of $7 million to $9 million). The "moderately favorable" category, with differentials near $5 million, included the Anclote, Lake Jessup, and phosphate mining sites. The two "highly favorable" sites with zero cost differentials were Crystal River and DeBary. Two additional cost elements which were considered in a non-quantitative fashion were the differential costs of air pollution control equipment and the potential cost advantages of barge access. Air pollution control was a negative factor for the St. Marks, Crystal River, and phosphate mining sites, and mildly negative for Anclote and Palatka North. Water access was a strong positive factor for Gulf County, Crystal River, and the two sites near Palatka.

The two sites in the "unacceptable" cost category were eliminated from further consideration. The four sites in the "marginal" category were not ruled out on the basis of cost alone, but subsequently were eliminated because of a lack of compensating factors and the existence of serious liabilities. In the case of the sites near Palatka, the liabilities included site development and land use problems, and especially the need to construct major new transmission corridors. The two Levy County sites were ruled out because of the strong local sentiment in support of preserving natural amenity and water quality in the Suwannee River valley.

Two of the remaining five sites were eliminated on the basis of pairwise comparisons. The Anclote site was judged inferior to Crystal River because of the severe physical limitations of the Anclote property, the proximity to urban development, the less satisfactory transportation arrangements than at Crystal River, and the sensitivity of the Anclote area to water quality impact. Lake Jessup, likewise, was eliminated on the basis of a comparison with the phosphate mining site. The problems involving land acquisition, land use compatibility, and possibly water supply at Lake Jessup were judged to outweigh the air quality problems expected at the phosphate mining property.

The locations remaining were Crystal River, DeBary, and the phosphate mining site. In forming a final comparison between these sites, two separate options were considered at Crystal River: the use of fresh water for cooling system makeup, and the use of saltwater cooling towers. The four options thus available were evaluated in terms of four general categories of environmental impact: water supply, wastewater discharge, ambient air quality, and terrestrial ecology.

Water supply would involve significant negative impacts at the DeBary site and at Crystal River if fresh water were utilized. The important issues would be alteration of hydroperiod (or water table drawdown, if wells were used at Crystal River) and entrainment of aquatic organisms. These issues would not apply to the use of municipal wastewater at the phosphate mining site, and would have limited importance for withdrawals of salt water from the existing discharge canal at Crystal River. Wastewater discharges would have greatest impact at DeBary and at the phosphate mining site, due to the nature of the river systems affected.

Ambient air quality would be a negative factor for all sites except DeBary. As for terrestrial ecology, the relatively low on-site impacts associated with power plant construction at the phosphate mining site would probably be more than offset by the need to construct a 64-kilometer (40-mile) pipeline for water supply.

The overall comparison indicated that new power plant facilities at Crystal River with saltwater cooling towers would have only one major liability--air quality--whereas the other options would each involve two or more general liabilities (see Table 9). Therefore, the Crystal River site was selected as the preferred alternative by Florida Power Corporation. Subsequent studies have shown that all applicable air quality regulations can be met for the proposed power generating facilities at the preferred site.

Table 9. Summary of Environmental Liabilities and Costs Associated with the Three Most Favorable Sites

Facility Site	Water Supply	Wastewater Supply	Ambient Air Quality	Terrestrial Ecology	Total Comparative Costs (millions of Dollars)*
DeBary	X	X			0
Phosphate zone		X	X	(X)	5-6
Crystal River (with fresh-water cooling)	X		X		0
Crystal River (with salt-water cooling)			X		0

* See Table 8.

Source: Environmental Science and Engineering, Inc., 1978.

PROCESSING ALTERNATIVES

ENERGY SOURCE ALTERNATIVES

Coal, as a fuel for steam electric generation, is considered the best alternative for the Crystal River site. The availability of coal nationally on a long-term basis, higher efficiency of newer generation units, shorter lead time to on-line generation, and the existing coal handling facilities on the site, make coal-fired units the desired alternative. Coal is also the preferred fuel in light of recent governmental policies and directives regarding the use of energy resources. Based on a detailed cost analysis of low-sulfur versus high-sulfur coal, Florida Power has chosen low-sulfur coal (less than 0.6 pounds sulfur per MBtu) as economically the best fuel for the proposed units.

Based on the long lead time (presently 10 years) required for licensing, design, and construction, nuclear power was not considered a feasible alternative for the proposed units since Florida Power has determined the additional capacity is needed by 1982.

COOLING SYSTEM ALTERNATIVES

It is not possible to use all of the heat energy transferred from the fuel source to steam in the generation of electrical energy. The function of a cooling system is to remove this excess heat from the plant site on a continuous and operational basis. Cooling systems considered were:

1. Once-through cooling;
2. Power spray modules;
3. Natural draft wet cooling towers;
4. Mechanical draft wet cooling towers; and
5. Dry and wet-dry cooling towers.

Once-through cooling was considered for the proposed facility because this method is used predominantly by utilities in Florida and is presently used by existing units at the proposed site. The existing system draws water from the nearshore estuarine area of the Gulf of Mexico and returns it to a similar area north of the intake. Intake and discharge is through canals. Other types of once-through cooling systems such as man-made ponds or lakes were considered.

Heat dissipation by spray cooling was considered because sufficient land was not available for cooling ponds, but increased heat dissipation through existing canals was desired.

Two types of wet cooling tower systems were considered: mechanical draft and natural draft. Both of these systems use evaporative cooling. Mechanical draft towers depend upon fans to create air currents, while natural draft towers create a current of air, based upon their chimney-like structure. Natural draft towers have the greatest potential for adverse aesthetic impact and obstruction due to their size and visibility. The use of salt or brackish water in any cooling tower system would bring forth concerns about salt drift.

Dry cooling tower systems are based on indirect contact between the air and the hot water, and heat transfer takes place through convection and conduction. However, the impairment of condenser pressure for summer ambient conditions results in year-round penalties in plant performance which make dry cooling systems economically difficult to justify, especially in Florida. Combination wet/dry towers use evaporation, conduction, and convection for cooling and usually are intermediate in cost between dry systems and wet systems. The higher costs of dry and wet/dry seasons are probably the main reason why neither of these systems is being used in Florida at this time. High costs of dry and wet/dry systems (reflected in the number of towers required) were not considered to offset reductions in water consumption.

Economic Considerations

Capital and annual costs developed in 1977 (Black & Veatch, 1977) for cooling alternatives at the proposed Crystal River site location are summarized in Table 10. Costs presented are per proposed unit.

Technical Considerations

All of the cooling systems considered are technically feasible. Technical considerations are reflected to a great extent in the economic rankings presented in the previous section. Once-through cooling is the system most widely used by Florida utilities. A ranking of cooling systems considered according to number in use throughout the United States most probably would reveal the following ranking:

1. Once-through cooling,
2. Mechanical draft cooling,
3. Natural draft cooling,
4. Dry and wet/dry cooling, and
5. Power spray modules.

Reliability of each of these systems is high enough to make all of them technically available for cooling consideration for the proposed units. Significant differences in operation and maintenance could emerge once a source of cooling water is selected. For example, few saltwater cooling towers are in operation at this time due to lower heat transfer, less evaporative heat loss, and higher corrosion properties of salt water.

Environmental Considerations

Once-Through Cooling

Studies associated with the existing three units of the proposed site have determined a number of impacts associated with once-through cooling. Generally speaking, the major environmental effects of once-through cooling fall into three groups:

1. Impingement, or the impacts associated with the screens which strain larger organisms from the incoming water;

Table 10. Capital and Annual Costs for Cooling Alternatives at Crystal River

Total Capital Costs (Location 1c)

Alternative	Avg. Cost/Mw (10^3\$)
Once-Through Cooling	24.503
Mechanical Draft Tower (saltwater)	25.553
Mechanical Draft Tower (freshwater)	26.857
Natural Draft Tower (saltwater)	28.619
Natural Draft Tower (freshwater)	28.946
Spray/Dilution System	37.288

Total Annual Costs (Location 1c)

Alternative	Avg. Cost/Mw (10^3\$)
Once-Through Cooling	9.552
Natural Draft Tower (saltwater)	12.765
Natural Draft Tower (freshwater)	12.789
Mechanical Draft Tower (saltwater)	13.849
Mechanical Draft Tower (freshwater)	14.256
Spray/Dilution System	16.111

Note: Operation and maintenance costs were included in these cost comparisons.

Source: Black and Veatch, 1977.

2. Entrainment, or the impacts associated with passage through the power plant of smaller organisms than those affected by impingement; and
3. Impacts associated with organisms which are exposed to the heated plume from the plant.

Other alterations in the environment include alterations brought about by changes in existing circulation patterns and biocide treatments. Recent studies indicate that potentially toxic bromates may be produced by a sunlight-induced reaction in chlorinated sea water (Macalady, _et al_., 1977).

Impingement of finfish and invertebrates reported for the existing Units 1, 2, and 3 are presented in Tables 11 and 12. Species of economic importance accounted for about 8 percent of the impinged biomass (Snedaker, 1972 to 1974). If source water is taken from the existing intake canal for the proposed units, increased volumes may be expected to increase the total number of species impinged. Entrainment effects are concentrated on small, drifting organisms. Maturo, _et al_. (1974) estimated 900 to 2,300 kilograms (2,000 to 5,100 pounds) per day of biomass entrained by existing Units 1 and 2. Estimates for entrainment by existing Units 1, 2, and 3, and proposed Units 4 and 5 total 2,700 to 6,950 kilograms (6,000 to 15,300 pounds) per day. Effects of the thermal plume have been studied by Lehman (1974), McKellar (1975), Smith (1976), and Young (1974) for various subsystems of the estuarine receiving water. Productivity was found to be generally lower in the discharge bay than the intake bay. Van Tine (1974) found algal biomass lower on the discharge side. These lower productivities were attributed to thermal discharge from Units 1 and 2. In addition, Evink and Green (1974) reported smaller biomass of bottom-dwelling invertebrates in the discharge area than in the intake.

Cooling Towers

The general effects of cooling towers on the environment include the following factors:

Table 11. Mean 24-Hour Impingement Rates of Finfish at Crystal River Units 1, 2, and 3 (1977-1978), Crystal River Unit 2 (1972-1973) (Biomass data in kg)

	Units 1, 2, 3 1977-1978* (1,318,000 gpm)		Unit 2 1972-1973† (328,000 gpm)	
Month	Number	Biomass	Number	Biomass
January	29,662	291.4	472	24.3
February	20,187	96.0	1,728	50.6
March	2,966	82.1	932	28.1
April	2,734	32.2	333	11.9
May	737	8.8	190,571	824.6
June	684	43.6	438	12.6
July	1,071	36.2	2,384	12.6
August	891	21.5	92	5.4
September	387	11.5	92	2.6
October	568	15.3	298	5.8
November	2,544	41.2	282	15.8
December	25,286	218.5	666	36.4
MEAN	7,310	74.9	16,524	85.9

*From NUS, 1978.
†Calculated from Snedaker (1974).

Source: NUS, 1978.

Table 12. Mean 24-Hour Impingement Rates of Invertebrates at Crystal River Units 1, 2, and 3 (1977-1978), Crystal River Unit 2 (1972-1973) (Biomass data in kg)

Month	Units 1, 2, 3 1977-1978* (1,318,000 gpm) Number	Biomass	Unit 2 1972-1973† (328,000 gpm) Number	Biomass
January	5,179	31.3	298	2.0
February	2,961	13.2	220	2.0
March	2,771	24.2	131	1.0
April	1,015	32.2	180	18.8
May	345	26.7	89	7.0
June	567	6.2	316	3.2
July	2,943	16.8	789	2.6
August	2,749	17.4	59	0.4
September	1,557	39.3	84	0.6
October	651	13.2	699	1.1
November	1,852	28.5	84	0.5
December	1,047	21.6	508	2.4
MEAN	1,970	22.6	288	3.5

*From NUS, 1978.
†Calculated from Snedaker (1974).

Source: NUS, 1978.

1. Fogging;
2. Icing caused by cold weather fogging;
3. Deposition of chemically-laden drift particles, especially when saltwater makeup water is used;
4. Consumptive use of water;
5. Climate modification due to the atmospheric discharge of heat and water vapor;
6. Effects on receiving water as a result of blowdown discharge;
7. Acid rainout due to mingling of cooling towers and stack gas plumes; and
8. Noise.

These factors are summarized by EPA researchers (Shirazi, et al., 1977).

Fogging and icing, caused by cold weather fogging and acid rainout, are not considered to be serious impacts at the Crystal River site if cooling towers are used. Noise is not likely to be a problem at the rather isolated site. Acid rainout is unlikely due to the site meteorology and design of the stacks and cooling towers.

The effects of salt drift from cooling towers are of importance. Drift rate values for saltwater cooling towers with new drift eliminator designs are estimated to be within the range of 0.002 to 0.005 percent of the total circulating water. Measurements from the two U.S. plants presently using natural draft towers with brackish water as makeup (B.L. England Unit 3, Atlantic City Electric Company, and 1,260 Mw plant in Maryland) reported a measured drift of about 0.0005 percent.

Salt deposition can have detrimental effects upon vegetation, especially those species which are more sensitive. The extent of impact would depend upon prevailing wind patterns and the sensitivity of surrounding plant communities.

Comparative Analysis of Economic, Technical, and Environmental Considerations

The following primary points were considered in the selection process of feasible cooling alternatives:

1. Even with power spray modules, the problem of sufficient land area for cooling lakes was not overcome. The increased costs of spray modules contributed higher economic costs, making this alternative undesirable.
2. Installation of power spray modules in the existing discharge canal would not achieve sufficient cooling to meet State of Florida effluent standards without additional dredging. Salt drift would also occur. The high costs of this alternative and its inability to meet state standards without significant modification to the existing canal system make it an undesirable alternative.
3. Cooling lakes or ponds would require a large area for containment. Florida Power does not control sufficient land suitable for the pond. Large areas of natural terrestrial habitat would be destroyed in the construction of such a pond. Economic costs of land acquisition and development would be high. For these reasons, this alternative was not considered desirable.
4. Once-through cooling systems process large volumes of water (high heat impact), have high impingement and entrainment rates, produce changes in circulation patterns, and require more biocide treatment. Economic costs are lower, partially due to less technical development. Present state and federal legal structures may forbid once-through cooling.

Table 13 lists advantages and disadvantages of various cooling alternatives listed.

Table 13. Analysis of Alternative Cooling Systems: Environmental Considerations

	Advantages	Disadvantages
Once-through Cooling (estuarine water)	1. Low costs 2. No fresh water consumption* 3. Possibility of desalinization process	1. New dredging required 2. Impingement of large numbers of finfish and shellfish 3. Entrainment of large amounts of planktonic forms 4. Increased size of area swept by present thermal plume 5. Biocide additions
Natural Draft Cooling Towers with Freshwater Makeup	1. No salt drift 2. Area is rated low for fogging potential	1. Consumptive use of fresh water 2. If ground water is used, potential for saltwater intrusion exists 3. Biocide and antiscaling chemical additions (fewer biocides if ground water is used)
Natural Draft Cooling Towers with Saltwater Makeup	1. No consumption of fresh water* 2. Area rated low for fogging potentials	1. Potential for salt drift 2. Potential for increased technical problems due to corrosion 3. Biocide and chemical additions 4. Somewhat more flow required than if fresh water used. Increased entrainment of saltwater organisms

Table 13. Analysis of Alternative Cooling Systems: Environmental Considerations (Continued, page 2 of 2)

	Advantages	Disadvantages
Mechanical Draft Cooling Towers with Freshwater Makeup	1. No salt drift 2. Area rated low for fogging potential 3. Reduced volume of water flow than if salt water is used. Rewer organisms would be entrained if surface fresh waters are used	1. Increased noise over natural draft tower 2. Higher initial and operating costs than natural draft tower 3. Consumes more power than napzisr draft tower. The power produced contributes to air pollution and discharge impact 4. More noise than natural draft tower
Mechanical Draft Cooling Towers with Saltwater Makeup	1. No consumption of fresh water* 2. Area rated low for fogging potential	1. Increased noise over natural draft 2. Potential for salt drift greater than natural draft 3. Higher initial and operating costs than natural draft 4. Consumes more power than natural draft. Power produced contributes to higher air and water emissions 5. More water would be needed than if fresh waters are used. Leads to larger entrainment 6. More noise than natural draft tower
Power Spray Modules (saltwater only)	1. No consumption of fresh water	1. Salt drift near canal 2. High costs 3. Large volumes of water needed. Leads to large impingement and entrainment 4. New dredging required

*Fresh water would still be required for boiler makeup and service water.

Source: Environmental Science and Engineering, Inc., 1978.

WATER SOURCE ALTERNATIVES

Water source alternatives ranged from fresh water to salt water. The following sources were considered:

Fresh Water
- Crystal River
- Withlacoochee River
- Lake Rousseau
- Freshwater aquifer (shallow wells)

Salt Water
- Gulf of Mexico
- Withlacoochee Reach of Barge Canal
- Saline Aquifer (deep wells)

Figure 7 illustrates the locations of source water bodies in relation to the proposed plant site.

Freshwater Sources

Surface Water--Generally, fresh waters would be feasible sources only if cooling towers are used. Freshwater sources include the Crystal River, 4.8 kilometers (3 miles) to the south, the Withlacoochee River, and Lake Rousseau, 6.4 and 5.8 kilometers (4 and 3.6 miles) to the north and northeast, respectively, and a well field 9.2 kilometers (5.7 miles) to the east of the plant site (see Figure 7).

The Crystal River runs from several head springs of King's Bay to the Gulf of Mexico. The maximum flow during normal tides is about 112 cubic meters (4,000 cubic feet) per second, 9,780,000 cubic meters (2,584 million gallons) per day. The river contains many aquatic weeds, and a wide variety of freshwater and estuarine organisms.

Lake Rousseau is an artificial impoundment of the Withlacoochee River created by Florida Power Corporation in 1909 for hydroelectric power generation. During the 1960's, the lake became part of the U.S. Army Corps of Engineer's Cross Florida Barge Canal project. The lake was modified for the barge canal project with the construction of the Inglis

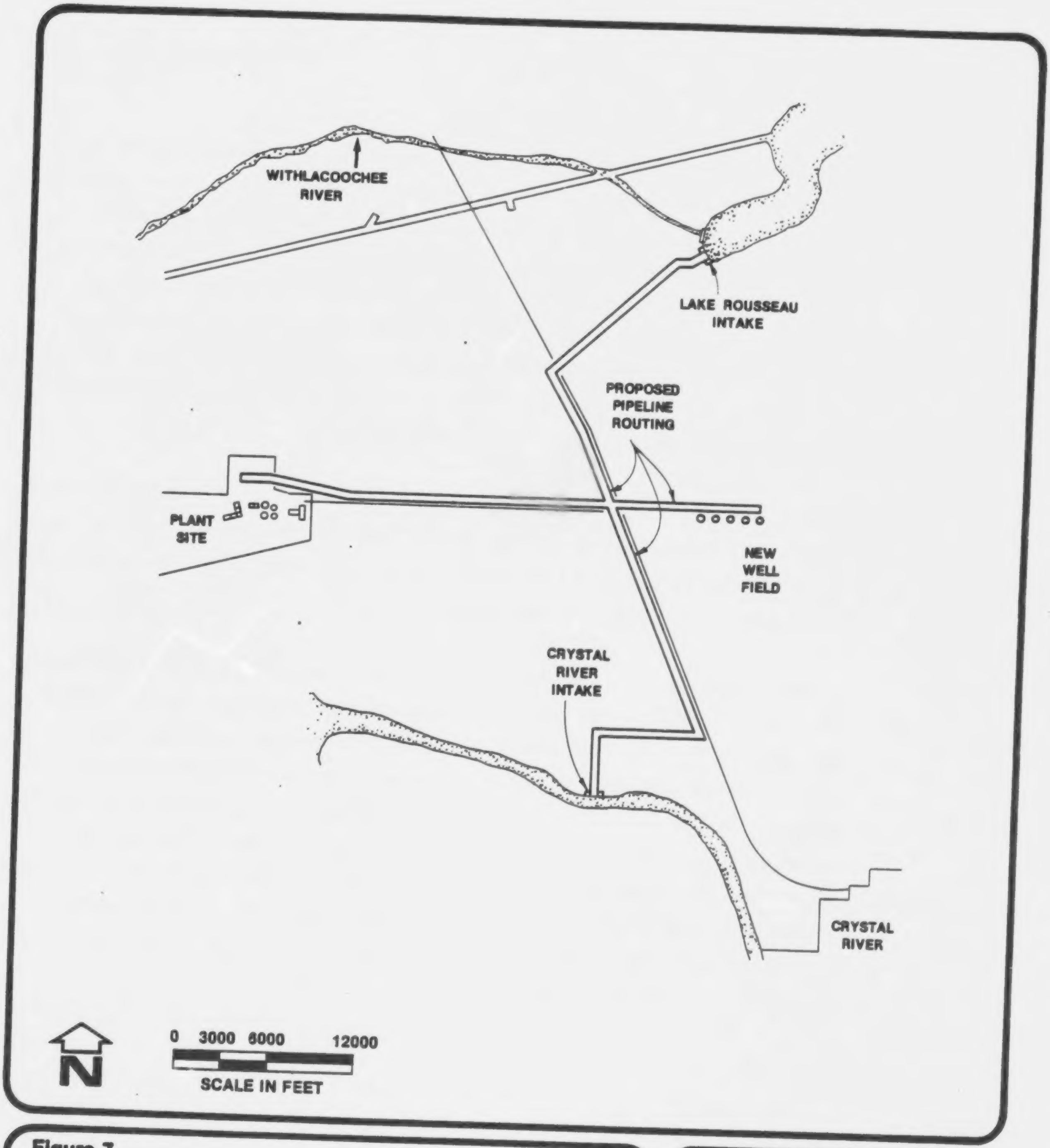
WITHLACOOCHEE RIVER
LAKE ROUSSEAU INTAKE
PROPOSED PIPELINE ROUTING
PLANT SITE
NEW WELL FIELD
CRYSTAL RIVER INTAKE
CRYSTAL RIVER
N
0 3000 6000 12000
SCALE IN FEET

Figure 7

FRESHWATER SOURCE LOCATIONS

SOURCE: BLACK AND VEATCH, 1969
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1980.

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

Lock, the Withlacoochee River Bypass Canal, and the Withlacoochee Reach of the Barge Canal, which lies west of the lake. Annual excess flow through the lake is 9.0×10^8 cubic meters per year. The proposed project would require a maximum consumptive use of 76,000 cubic meters of the Barge Canal, which lies west of the lake. Annual excess flow through the lake is 9.0×10^8 cubic meters per year. The proposed project would require a maximum consumptive use of 76,000 cubic meters (20 million gallons) per day, which is 3.3 percent of the Withlacoochee River 100-year low flow.

The Withlacoochee River drains an area of approximately 518,000 hectares (1,280,000 acres) in its 256-kilometer (159-mile) course. Most of the river's average discharge of about 1,938 cubic meters (512,000 gallons) per minute goes into Lake Rousseau.

Ground Water--Well fields would need to be located 8.2 to 8.7 kilometers (5.4 miles) east of the plant to minimize the potential for horizontal saltwater intrusion. Flow net analysis of the area indicates the aquifer should be adequate to support the proposed withdrawal; however, an aquifer pump test obtained much lower transmissivity values than those estimated. In the absence of more transmissivity data, and actual knowledge of solution channels or local zones of high permeability, the conceptual well field would require an extensive linear arrangement of 139 wells with almost 30 kilometers (18 miles) of pipe to get the required cooling tower makeup water to the plant site.

Saltwater Sources

Surface Water--Sources of surface saltwater cooling are the Gulf of Mexico and the Withlacoochee Reach of the Cross Florida Barge Canal. The Gulf serves as a cooling source for existing Units 1, 2, and 3 through a once-through system. The coastal/estuarine area through which the water is cycled is of low-energy (mean tidal range about 1 meter). Small embayments are created by scattered islands and coastline irregularities, but the area is generally open to the broad expanse of the Gulf. Shallow, in-shore flats often are exposed at low tide. The area generally can be considered an ecologically productive one, with marine grasses, oyster reels, coastal salt marshes, and deeper water plankton systems. The Gulf of Mexico can provide the necessary quantities of water for cooling either with towers or with a once-through cooling system.

The Withlacoochee Reach of the Cross Florida Barge Canal was created as part of the initial construction of the Gulf Reach of the Barge Canal. Fresh water enters this canal by infiltration from the surficial aquifer, by seepage through the Inglis Dam and the Inglis Lock, and by discharge of high river flow over the Inglis Dam Spillway. Saline water from the open Gulf is exchanged with the fresh water as a result of tide and wind action.

There is little information about the ecological character of the canal; therefore, its ecological value is unknown at this time. Because the canal is open-ended on the Gulf, it can provide the necessary quantities of water.

Saline Ground Water--Underlying the freshwater aquifer is water of higher salinity. Potential yield and quality of water are largely unknown. If considerations of other sources were not feasible, then more testing and investigation would be needed for this source before it could receive specific consideration.

Desalinization

The Southwest Florida Water Management District (SWFWMD 1977) has suggested the use of a once-through cooling system with estuarine water coupled with a desalination process. This system would allow power plants to produce fresh water rather than consume it. The energy and economic costs of this process are unknown at this time. Reported costs for various desalination plants are presented in Table 9.5-2 of

Chapter 9 (Technical Support Document). Study would be needed to determine if this alternative is feasible.

Economic Considerations--Comparative capital and annual costs of alternative freshwater supply sources are shown in Table 14. Data were not available for the Withlacoochee River as a source.

The Crystal River source has the highest capital cost of the three freshwater water supply sources considered, as well as the highest total annual cost. The primary reason for the higher costs is that Crystal River alone would not provide proper quality of raw water, and use of freshwater wells for stream cycle makeup water would have to be provided. Costs for development of the Withlacoochee River would probably be between the costs for use of Crystal River and Lake Rousseau; depending, of course, on detailed analysis of quantity available (possible well field subsidy as required for Crystal River) and additional piping requirements.

Cost data for saltwater sources specific to the proposed site are available only for the Gulf of Mexico (see Table 10). Major costs would be for the intake system and canal work to modify existing canals. Total capital costs for Gulf of Mexico source water drawn through the existing canal system are generally less than $10,000,000 for any of the proposed cooling alternatives. Annual maintenance costs range from $40,000 to $100,000 per year depending on the cooling alternative. Site-specific cost data were not available for the following additional saltwater source alternatives: Withlacoochee Reach of the Barge Canal, deep wells (saline aquifer), or desalination. All of these latter alternative sources probably will be more expensive than the Gulf source.

Distance from the power plant and acquisition of rights-of-way, and future uncertainties as to the dispensation of the canal make the Barge Canal a less desirable alternative. Costs for deep (saline) wells would

Table 14. Comparative Capital and Annual Costs--Alternative Freshwater Supply Sources--Crystal River Units 4 and 5

	Water Source		
	Crystal River	Lake Rousseau	Well Field
Capital Costs	$7,775,000	$5,325,000	$4,879,000
Annual Costs	786,000	118,000	146,000

Source: Black and Veatch, 1977.

be higher than those for the shallow (freshwater) field due to increased drilling and piping costs, and varying quality of the source.

Site-specific estimates for the most apparent cost-effective source alternatives were included. A relative ranking of alternatives according to lowest estimated cost (or in cited cases, speculated cost) is:

Gulf of Mexico
Lake Rousseau
Shallow wells (freshwater)
Withlacoochee Reach Cross Florida Barge Canal
Crystal River
Withlacoochee River
Deep Wells (saline water)

The Gulf of Mexico as a source of cooling water is the cheapest alternative, when drawn from the existing intake canal. Cost data for drawing water for proposed Units 4 and 5 from the discharge canal of Units 1, 2, and 3 are not yet available. Although these costs would appear to be similar to intake canal costs, there is a small energy penalty associated with using the discharge water as cooling water due to the necessity for precooling. Piping costs for taking water from the existing discharge canal would be lower.

Technical Considerations

Consumptive water use is one measure of the differences between cooling water alternatives and source quality. These water uses are presented in Tables 15 and 16. Total water used (not to be confused with water consumed) is another measure since some alternatives such as once-through cooling have low consumptive uses. For example, a once-through cooling system will utilize 460,000 gpm compared with a closed cycle system which will utilize 304,000 gpm for condensing steam. The concentrations of dissolved solids in Lake Rousseau are lower than either Crystal River or well fields. This factor partially determines the amount of water needed. Estuarine waters contain larger quantities of

Table 15. Estimated Station Water Consumption at Crystal River Units 4 and 5, Using Saltwater Natural Draft Cooling Towers

	Water Source					
	Existing Intake gpm		Existing Discharge gpm		Barge Canal gpm	
Requirement	Avg.	Max.	Avg.	Max.	Avg.	Max.
Cooling Tower Makeup	24,000	50,000*	29,700	48,800†	---	---
Service Water (Freshwater)	400	1,000	400	1,000	---	---
Raw Water (Freshwater)	100	300	100	300	---	---
TOTAL	12,500	26,300	30,270	50,100	---	---

*Includes only condenser cooling. Condenser water cycled through cooling tower; auxiliary cooling once-through.

†Includes condenser and auxiliary cooling. Both process waters cycled through cooling tower.

Source: Environmental Science and Engineering, Inc., 1978 based on data by Black and Veatch.

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Table 16. Estimated Station Water Consumption at Crystal River Units 4 and 5, Using Freshwater Natural Draft Cooling Towers

	Water Source					
	Crystal River gpm		Lake Rousseau gpm		Well Field gpm	
Requirement	Avg.	Max.	Avg.	Max.	Avg.	Max.
Cooling Tower Makeup (condenser and auxiliary)	9,200	13,750	8,300	12,400	8,850	13,200
Service Water	400	1,000	400	1,000	400	1,000
Raw Water	100	300	100	300	100	300
Total	9,700	15,050	8,800	13,700	9,350	14,500

Source: Black and Veatch, 1977.

dissolved solids than does fresh water. The water sources can be listed in order of engineering acceptability based upon hardness, salinity fluctuations, and intake temperatures. Such a list is as follows:

Lake Rousseau
Withlacoochee River
Well Field
Crystal River
Existing Intake Canal
Existing Discharge Canal
Cross Florida Barge Canal

All of these sources have waters of a quality sufficient for cooling. Table 17 compares estimated water availability from each source with potential requirements. Availability is based only on hydrologic computations and does not take regulations into account.

Consumptive use is about the same for all freshwater sources. Lake Rousseau is the lowest. Because its water contains the lowest level of dissolved solids, the cooling tower can evaporate more water before critical ion concentrations are reached. Consumptive use of salt water may not be a concern, considering the size of the source.

Environmental Considerations

All water sources considered would exhibit some impacts if drawn upon by the proposed power plant. Impacts are intimately connected to the type of cooling system used; therefore, additional impact summary can be found in the alternative cooling system section. Impacts on water sources include:

1. Entrainment of Organisms;
2. Impingement of Organisms;
3. Water Use;
4. Water Quality;
5. Water Consumption;
6. Circulation Pattern Alternation/Disruption;
7. Horizontal Salinity Intrusion;

Table 17. Estimated Water Availability and Requirements of Possible Sources for Crystal River Units 4 and 5.

Source	Maximum Requirements (mgd)			Available
	Cooling	Other	Total	Supply (mgd)*
Crystal River	19.8	1.9	21.7	593 (Mean Annual Flow) 292 (Minimum Annual Flow)
Lake Rousseau	17.8	1.9	19.7	6,593 (Mean Annual Available) 73 (Minimum Annual Available)
Withlacoochee River (at Holder)	17.8	1.9	19.7	737 (Mean Annual Flow) 73 (Minimum Annual Flow)
Freshwater Aquifer	19.0	1.9	20.9	Area Dependent
Gulf of Mexico	64.8	---	64.8	Unlimited
Cross Florida Barge Canal	64.8	---	64.8	Potentially Unlimited
Saltwater Aquifer	64.8	---	64.8	Potentially Unlimited

*Hydrological basis only, exclusive of environmental and political contraints.

Sources: Geraghty and Miller, Inc., 1978.
USGS Water Resources Data for Florida, 1976.
Environmental Science and Engineering, Inc., 1978.

8. Vertical Upwelling Effects on Quality;
9. Lowering of Surface Water Tables; and
10. Construction Impacts of Intake Structures.

A summary of environmental assessment of alternative water sources is given in Table 18. A general ranking of sources based on environmental considerations cannot be made completely independent of alternative cooling systems.

INTAKE ALTERNATIVES

Intake locations were considered for the following water sources:

Crystal River
Lake Rousseau
Gulf of Mexico

Crystal River as a source of cooling water was considered with an intake structure at a site approximately 4 kilometers (2.5 miles) downstream (west) of the town of Crystal River. For Lake Rousseau, an area of the lake east of the Inglis Dam has been chosen by Florida Power as the general location of a proposed cooling water intake structure. This area extends from the dam upstream about 2.4 kilometers (1.5 miles). Intake locations proposed for estuarine cooling water from the Gulf of Mexico are near the existing intake for the existing units. Differences in layout of the plant site place the proposed intake either upstream or downstream of existing intakes in the intake canal. Drawing intake water for proposed units from the discharge canal of the existing units to reduce impingement and entrainment was also considered.

Economic Considerations

Cost of intake stuctures for several cooling system alternatives and water sources is shown in Tables 19 through 22.

From these data, it appears that intake systems using Gulf of Mexico water generally have lower capital costs. Freshwater intakes have lower

Table 18. Environmental Assessment of Alternative Water Sources

Water Source	Advantages	Disadvantages
Gulf of Mexico through existing canals	1. Lower costs. 2. No consumptive use of fresh water for cooling. 3. If existing discharge canal is used as makeup, entrainment effects could be reduced.	1. Entrainment of important species. 2. Impingement of important species (for once-through or PSM). 3. If cooling towers are used salinity contributes to technical problems and larger volume of water needed than fresh sources.
Withlacoochee Reach of Cross Florida Barge Canal	1. Systems altered would be of lower value. 2. No consumptive use of fresh water for cooling.	1. Uncertainty of future plans for the area. 2. If cooling towers are used, a lower volume of water will be needed than for freshwater sources but technical problems may arise.
Crystal River	1. Water of lower salinity than above sources.	1. Consumptive use of fresh water. 2. Entrainment of important species. 3. Requires alteration of wetlands. 4. Percentage of water to be used is higher than for Lake Rousseau.
Lake Rousseau	1. Entrainment may be reduced by placing intake in waters of low biological productivity. 2. Percentage of water used is lower than at Crystal River. 3. May improve circulation in southwestern arm of the lake. 4. Dissolved solids lower than for Crystal River or well. fields would mean less water required for cooling towers.	1. Consumptive use of fresh water. 2. Potential for fouling problems from Asiatic Clam, *Corbicula.*
Well Fields	1. No entrainment or impingement.	1. Potential for salt water intrusion not clear. 2. Water availability not clear.

Table 19. Comparative Capital Costs of Intakes Relative to Cooling System Using Gulf of Mexico Water (in thousands of dollars)

	Mechanical Draft Tower	Natural Draft Tower	Spray/Dilution System	Once-Through Cooling
Intake System	936*	936	4,000	2,000
Piping System	1,416	1,151	2,173	2,173
TOTAL	2,352	2,087	6,173	4,173

*Based on water source drawn from existing intake canal.

Sources: Florida Power Corporation, 1978.
Black and Veatch, 1977.

Table 20. Comparative Maintenance Costs of Intakes Relative to Cooling System Using Gulf of Mexico Water (in thousands of dollars)

	Mechanical Draft Tower	Natural Draft Tower	Spray/Dilution System	Once-Through Cooling
Intake System	16.25*	16.25	97.50	65.00
Traveling Screens	8.55	8.55	39.40	39.40
Seaweed and Grass	27.60	27.60	60.00	60.00
TOTAL	52.40	52.40	196.90	167.40

*Based on water source drawn from existing intake canal.

Sources: Florida Power Corporation, 1978.
Black and Veatch, 1977.

Table 21. Comparative Maintenance Costs of Intakes Relative to Cooling System Using Fresh Water (in thousands of dollars)

	Natural Draft Tower Well Field	Natural Draft Tower Lake Rousseau	Mechanical Draft Tower Well Field	Mechanical Draft Tower Lake Rousseau
Intake Structure	—	7.10	—	7.10
Traveling Screens	—	4.60	—	4.60
Seaweed and Grass	—	18.40	—	18.40
TOTAL	—	30.10	—	30.10

Sources: Florida Power Corporation, 1978.
Black and Veatch, 1977.

Table 22. Comparative Capital Costs of Intakes Relative to Freshwater Sources (in thousands of dollars)

	Crystal River	Lake Rousseau	Well Field
Piping from wells	1,685	0	4,275
Piping from intake	5,405	4,800	0
Intake structure	531	525	0
Wells	154	0	604
TOTAL	7,775	5,325	4,879

*Estimates made prior to wellfield pump testing, costs now appear to be higher.

Sources: Florida Power Corporation, 1978.
Black and Veatch, 1977.

annual maintenance costs than saltwater, as would be expected. Comparative costs of freshwater intake sources show that the well field is the cheapest; however, new cost data, based on the lower transmissivity results of the actual pump test (Geraghty & Miller, 1978) of the well site, would probably be substantially higher. Lake Rousseau may then be the cheapest freshwater alternative relative to intake systems. Cost data for intake structures drawing from the existing discharge canal rather than the existing intake canal are not available.

An intake on the existing discharge canal should be somewhat lower in capital costs since piping costs would be reduced.

Technical Considerations

Technical aspects of intake location include physical placement on shoreline, depth of placement, and type of structure required. Figure 7 shows the most desirable intake locations relative to shoreline placement. The intake structure on Crystal River is approximately 4 kilometers (2.5 miles) downstream of the town of Crystal River. The area chosen as the general location of the intake structure for Lake Rousseau extends from the Inglis Dam upstream about 2.4 kilometers (1.5 miles). Intake structures of Gulf of Mexico water are sited immediately upstream or downstream of those for existing Units 1, 2, and 3. An alternative site for the proposed Units 4 and 5 is the existing discharge canal downstream of Units 1 and 2 discharge.

Types of structures considered for surface water sources include:

1. Conventional vertical traveling screens;
2. Double entry vertical traveling screens;
3. Perforated pipe; and
4. Double open water.

Depth of intake structures at Crystal River would be approximately 8 feet. Those in Lake Rousseau would be placed in 8 to 15 feet, depending on structure type.

Certainly from a technical standpoint, the perforated pipe is the simplest and cheapest; however, weed problems would require that vertical traveling screens be used. Tables 23 and 24 present cost summaries for the four types of intake structures.

Environmental Considerations

Environmental considerations of intake systems include impacts of construction; reduction or alteration of current patterns and velocities (siltation problems); impingement of marine algae and organisms; and navigational hazards.

These impacts are considered to be potentially greater for Crystal River than other surface water sources. Crystal River is in a popular fishing area and sustains boat traffic to the Gulf. Increased siltation can impact benthic organisms, and reduced river flow may have impacts on sessile, filter-feeding, and drifting organisms.

An intake placed in the existing discharge canal would reduce the impacts of cooling water withdrawal. Most of the water taken in would already have been entrained by Units 1, 2, and 3. Units 4 and 5 would be reusing the wastewater of the other units. In addition, the currents in the existing discharge canal would help to keep down impingement by sweeping the screens.

WATER DISCHARGE OPTIONS

Sources of water discharges include the following:

1. Circulating water;
2. Ash and sludge handling water;
3. Rainwater runoff;
4. Water pretreatment;

Table 23. Capital Cost Summary of Alternative Intake and Discharge Systems (in thousands of dollars)

	Conventional Vertical Traveling Screens	Double Entry Traveling Screens	Perforated Pipe	Double Open Water
Crystal River	265	267	Base	—
Lake Rousseau	176	178	36	648

Source: Black and Veatch, 1978.

Table 24. Annual Cost Summary of Alternative Intake and Discharge Systems (in thousands of dollars)

	Conventional Vertical Traveling Screens	Double Entry Traveling Screens	Perforated Pipe	Double Open Water
Crystal River	42	42	Base	—
Lake Rousseau	25	25	Base	91

Source: Black and Veatch, 1978.

5. Ion exchange regeneration;
6. Metal cleaning;
7. Plant drains;
8. Sanitary waste; and
9. Boiler blowdown.

Table 25 presents a description of the three wastewater flow alternatives considered. Sources of wastewater are given in Table 26. Schematics of these plans are presented in Figures 8, 9, and 10.

Surface Water

Discharges into surface waters of the plant site and surrounding area could occur from all of the sources listed. Circulating water or cooling tower blowdown would be discharged directly into the existing discharge canal. Surface runoff from the other sources will occur when detention ponds or perimeter ditches design capacities (based on the 10-year, 24-hour rainfall event of 8.37 inches) are exceeded. The majority of the surface overflow will ultimately end in the existing discharge canal to the Gulf.

Ground Water

Ion exchange regeneration and metals cleaning operations will generate wastewaters discharged to a neutralization basin. Water pretreatment wastes will go to the bottom ash system which includes recycling of water with dewatered ash going to a perimeter-ditched storage area. Plant drains will go to a plant drains collection pond. Coal storage runoff will be directed to a perimeter ditch system as will be general site runoff. All of the detention pond/perimeter ditch systems will discharge by exfiltration to ground water.

Evaluation

Considered alternatives can occur at several levels. Water discharge options can be (1) evaporative, (2) surface water, (3) ground water, and

Table 25. Wastewater Flow Alternatives

	Cooling Water	Service Water	Steam Cycle Water	Plant Drains Collection Pond	Wastewater Associated With Ash Disposal	Runoff Collection Retention System	Coal Storage
Alternate 1	From seawater Alternate addition from Lake Rousseau and pretreatment Blowdown discharge to Gulf via Long Channel	From wells Sewage effluent to cooling tower blowdown channel or groundcover irrigation Plant drains discharge to ash pond	From demineralizer Boiler recycle to demineralizer or pretreatment Condensate polishing utilized Waste effluent to ash pond No neutralization basin	Not included in this alternative	Ash Pond: Receives flow from plant drains system, cooling tower blowdown, rainfall, pretreatment, filtering condensate polishing Outflow to exfiltration, evaporation, overflow to cooling tower blowdown channel Ash storage: Incident rainfall overflow to cooling tower blowdown channel	Runoff controlled by grading and groundcover inflow from roof drains and grounds Outflow to evaporation, exfiltration, cooling tower blowdown channel	(In conjunction with coal runoff pond) Receives rainfall Outflow to cooling tower blowdown channel, evaporation, exfiltration
Alternate 2	From seawater Alternate addition from pretreatment Blowdown discharge to Gulf via Long Channel	From wells Sewage effluent to cooling tower blowdown channel Plant drains discharge to plant drains collection pond	From demineralizer Boiler cleaning wastes, condensate polisher blowdown to neutralization basin	Receives flow from plant drains, neutralization pond, rainfall Outflow to ash pond, evaporation, exfiltration Overflow to cooling tower blowdown channel	Ash pond: Receives from plant drains collection pond, water pretreatment and filtering, cooling tower blowdown, rain Outflow to evaporation, exfiltration, ash storage Ash storage: incident rainfall overflow to cooling tower blowdown channel	Receives flow from ash pond, ash storage, coal storage, grounds, rainfail Outflow to evaporation, exfiltration, cooling tower blowdown channel	Receives rainfall Outflow to runoff collection system, evaporation, exfiltration

Table 25. Wastewater Flow Alternatives (Continued, page 2 of 2)

	Cooling Water	Service Water	Steam Cycle Water	Plant Drains Collection Pond	Wastewater Associated With Ash Disposal	Runoff Collection Retention System	Coal Storage
Alternate 3	From seawater Blowdown discharge to Gulf via Long Channel	From wells Sewage effluent to dedicated percolation pond Plant drains discharged to plant drains collection pond	From demineralizer Boiler cleaning wastes, condensate polisher blowdown to neutralization basin	Receives flow from plant drains, neutralization basin, boiler blowdown, rainfall Outflow to ash landfill for dust suppression, evaporation, exfiltration No overflow structure	Ash landfill: Receives flow from plant drains collection pond, ash and rejects handling, rainfall Outflow to exfiltration, evaporation, overflow to retention collection system	Receives direct rainfall, roof drainings, overflow from coal storage and ash landfill Overflow to discharge canal, evaporation, exfiltration	Receives rainfall Overflow to runoff collection system, evaporation, exfiltration

Source: Environmental Science and Engineering, Inc., 1980.

Table 26. Sources of Wastewater: Their Flow Rates, Characteristics, and Possible Reuses

Source	Volume	Content	Possible Reuses
Cooling blowdown, fresh water	3,400-11,000 cmd* (0.9-3 mgd)	pH 6-7, TDS, low level organic phosphates and chlorine	Ash transport
Cooling blowdown, salt water maximum	333,100 cmd* (88 mgd)	Salts 31 ppt, phosphates, chlorine	
Demineralizer, condensate polisher	0.079 cmpm † (21 gpm)	H_2SO_4, N_2OH, concentrated minerals from freshwater inflow	Neutralizing, ash transport
Boiler cycle losses	.31 cmpm † (81 gpm)	High pH but low poise, still rather pure water	Recycle to demineralizer or for cooling tower makeup
Plant floor and equipment drains, all miscellaneous cleaning, etc.	0.19 cmpm † (50 gpm)	Oils, grease, pH, metals, no PCB's, phosphates, TSS	Ash transport
Roof drains	Average 0.08 cmpm † (Average 20 gpm)	TSS, rather clean	Most uses
Ash handling if 20 acres, 680 GPM exfiltrate, net rain gain 12.4 GPM	0.07 cmpm † 18 gpm entrained in ash	TSS, pH, metals, oil and grease	Recycle from pond for ash transport, entrained is lost
Coal runoff--Area 1	Average 0.3 cmpm † (Average 80 gpm)**	TSS, pH, metals, oil and grease	Neutralizing, ash handling
--Area 2	Average 0.16 cmpm † (Average 43 gpm)**		

Table 26. Sources of Wastewater: Their Flow Rates, Characteristics, and Possible Reuses (Continued, page 2 of 2)

Source	Volume	Content	Possible Reuses
Sewage	Average <0.05 cmpm (Average <13 gpm)**	Nutrients, BOD, TSS	Irrigation of grounds, ash handling
Metal cleaning	1,200,000 gallons at start up 360,000 gallons every 3-5 years	pH, TSS, oil and grease, metals	Neutralizing, ash handling

*cubic meters per day = cmd
†cubic meters per minute = cmpm
**gallons per minute = gpm

Source: Black and Veatch, 1976.

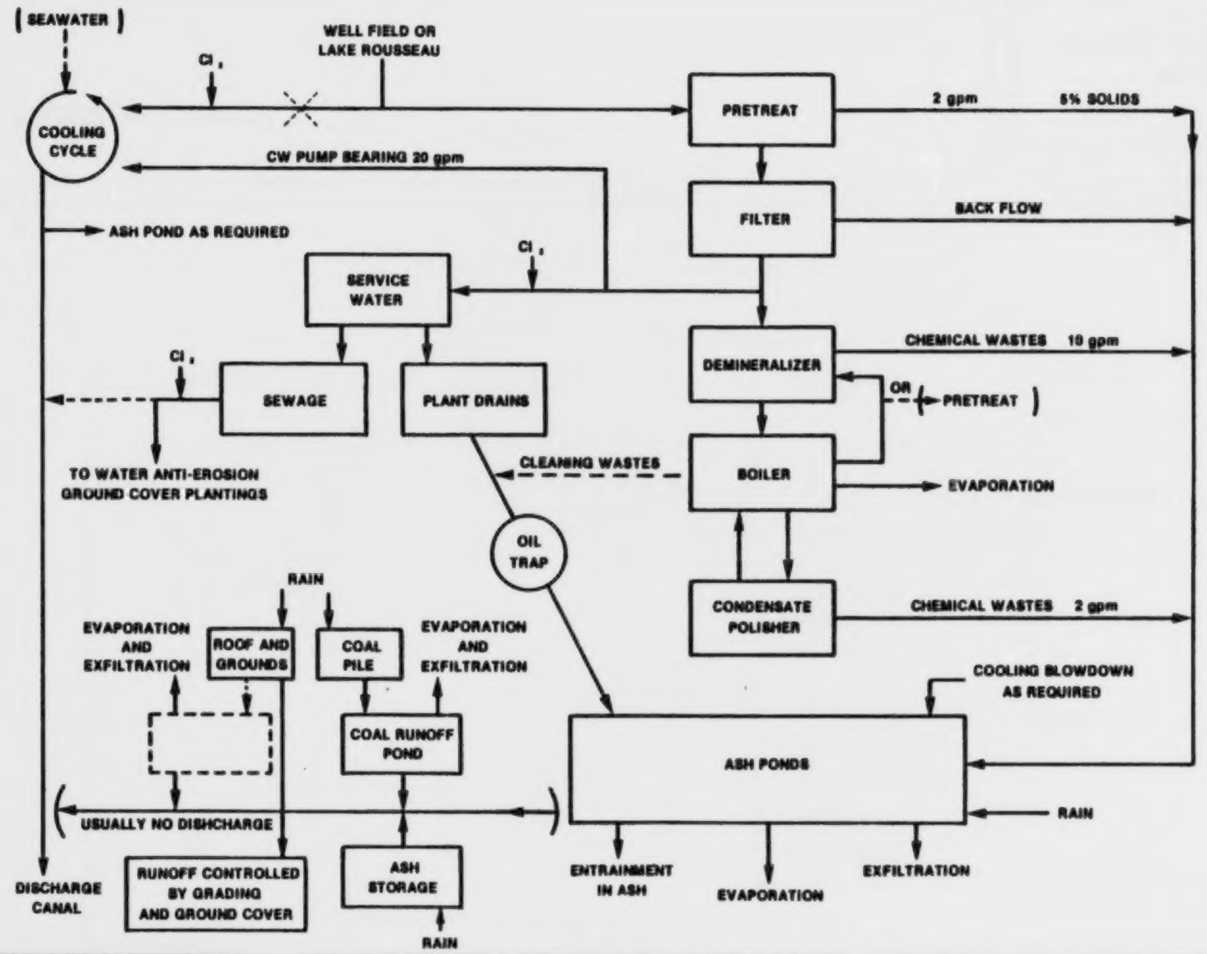
SEAWATER
COOLING CYCLE
Cl_2
WELL FIELD OR LAKE ROUSSEAU
PRETREAT
2 gpm
5% SOLIDS
CW PUMP BEARING 20 gpm
FILTER
BACK FLOW
ASH POND AS REQUIRED
SERVICE WATER
Cl_2
DEMINERALIZER
CHEMICAL WASTES 10 gpm
Cl_2
SEWAGE
PLANT DRAINS
OR
PRETREAT
TO WATER ANTI-EROSION GROUND COVER PLANTINGS
CLEANING WASTES
BOILER
EVAPORATION
OIL TRAP
CONDENSATE POLISHER
CHEMICAL WASTES 2 gpm
RAIN
EVAPORATION AND EXFILTRATION
ROOF AND GROUNDS
COAL PILE
EVAPORATION AND EXFILTRATION
COOLING BLOWDOWN AS REQUIRED
COAL RUNOFF POND
ASH PONDS
USUALLY NO DISHCHARGE
RAIN
DISCHARGE CANAL
RUNOFF CONTROLLED BY GRADING AND GROUND COVER
ASH STORAGE
RAIN
ENTRAINMENT IN ASH
EVAPORATION
EXFILTRATION

Figure 8
WASTEWATER FLOWS, ALTERNATE 1

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1980.

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

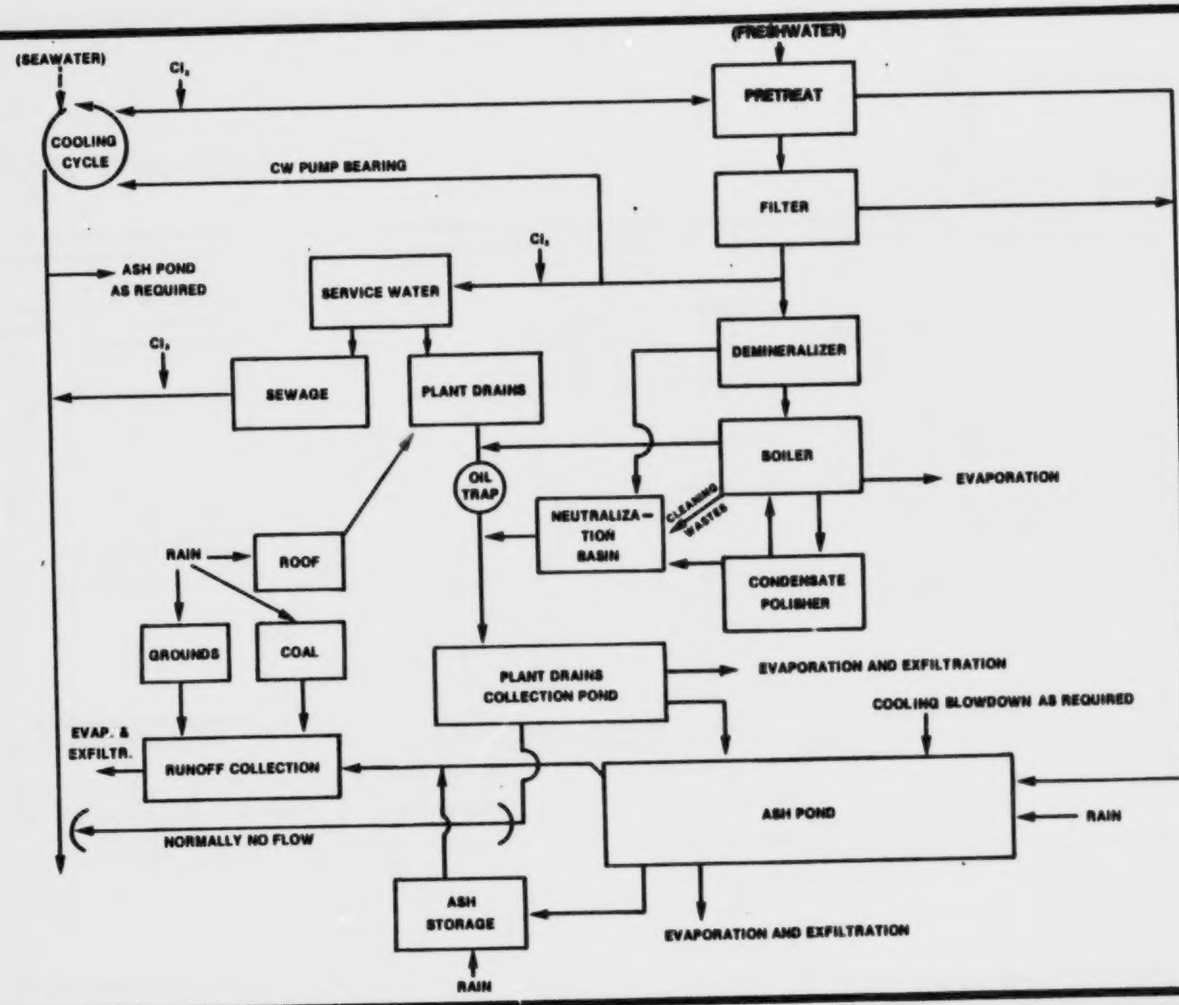
(FRESHWATER)
(SEAWATER)
Cl_2
PRETREAT
COOLING CYCLE
CW PUMP BEARING
FILTER
Cl_2
ASH POND AS REQUIRED
SERVICE WATER
DEMINERALIZER
Cl_2
SEWAGE
PLANT DRAINS
BOILER
EVAPORATION
OIL TRAP
NEUTRALIZA-TION BASIN
CLEANING WASTES
RAIN
ROOF
CONDENSATE POLISHER
GROUNDS
COAL
PLANT DRAINS COLLECTION POND
EVAPORATION AND EXFILTRATION
COOLING BLOWDOWN AS REQUIRED
EVAP. & EXFILTR.
RUNOFF COLLECTION
ASH POND
RAIN
NORMALLY NO FLOW
ASH STORAGE
EVAPORATION AND EXFILTRATION
RAIN

Figure 9
WASTEWATER FLOWS, ALTERNATE 2

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1980.

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

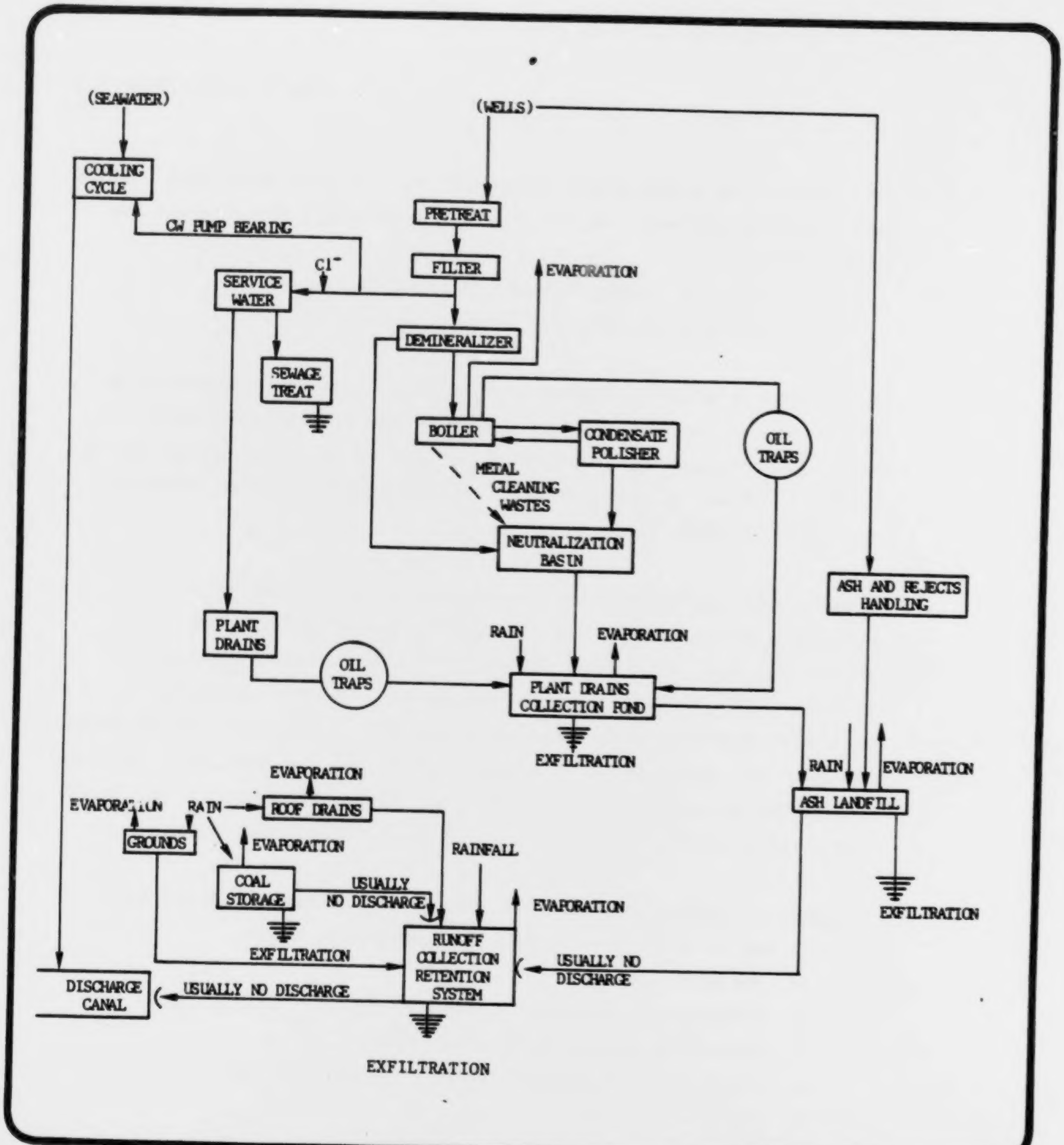
(SEAWATER)
COOLING CYCLE
(WELLS)
PRETREAT
CW PUMP BEARING
FILTER
Cl⁻
SERVICE WATER
EVAPORATION
DEMINERALIZER
SEWAGE TREAT
BOILER
CONDENSATE POLISHER
OIL TRAPS
METAL CLEANING WASTES
NEUTRALIZATION BASIN
ASH AND REJECTS HANDLING
PLANT DRAINS
RAIN
EVAPORATION
OIL TRAPS
PLANT DRAINS COLLECTION POND
EXFILTRATION
RAIN
EVAPORATION
EVAPORATION
ASH LANDFILL
EVAPORATION
RAIN
ROOF DRAINS
GROUNDS
EVAPORATION
RAINFALL
COAL STORAGE
USUALLY NO DISCHARGE
EVAPORATION
EXFILTRATION
EXFILTRATION
RUNOFF COLLECTION RETENTION SYSTEM
USUALLY NO DISCHARGE
DISCHARGE CANAL
USUALLY NO DISCHARGE
EXFILTRATION

Figure 10

WASTE WATER FLOWS ALTERNATE 3

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1980

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PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

(4) recycle, or combinations of these. The proposed units will utilize all discharge options. At the level of application the alternatives that exist are:

1. Lining/no lining of ponds or retention basins, and
2. Treatment/no treatment before discharge.

The economics of these alternatives have not been fully developed at this time, nor have all the environmental impacts been discerned. A substantial variety of technical variations on any of these options are feasible. Kinds of constituents that could potentially be discharged are given in Table 27.

Impacts from constituents of this type into surface and/or coastal receiving waters generally are related to human and organism health/toxicity, and ecological charges in production, structure or function. The general trend at this time is to avoid discharge to receiving waters as much as possible and apply dewatering (evaporative) and settling procedures. If accumulated solids are introduced into land fills, the potential for re-introduction of wastewaters into receiving waters is possible, depending upon subsurface flow conditions.

Economic Considerations--A speculative economic ranking of discharge options may be as follows in order of increasing cost:

1. Surface discharge;
2. Groundwater discharge (exfiltration);
3. Atmosphere (evaporative discharge);
4. Groundwater discharge (deepwell injection); and
5. Recycle.

Order may change due to variations in extent of application of each alternative.

Technical Considerations--Technical ranking of discharge options generally parallel those of economics. Deepwell injection may be an

Table 27. Sources of Wastewater and Their Characteristics

Source	Content
Cooling blowdown, fresh water	pH 6-7, TDS, low level organic phosphates and chlorine
Cooling blowdown, salinity range	Salts 32-50 ppt, phosphates, chlorine
Demineralizer, condensate polisher	H_2SO_4, N_2OH, concentrated minerals from freshwater inflow
Boiler cycle losses	High pH but low poise, still rather pure water
Plant floor and equipment drains, all miscellaneous cleaning, etc.	Oils, grease, pH, metals, phosphates, TSS
Roof drains	TSS, rather clean
Ash handling if 20 acres, 680 GPM exfiltrate, net rain gain 12.4 GPM	TSS, pH, metals, oil and grease
Coal runoff--Area 1 --Area 2	TSS, pH, metals, oil and grease
Sewage	Nutrients, BOD, TSS
Metal cleaning	pH, TSS. oil and grease, metals

Source: Black and Veatch, 1976.

exception in that it could be less complicated technically than other options depending on whether or not pretreatment would be exercised.

Environmental Considerations--Environmental considerations would probably force the following ranking in order of increasing impact potential:

1. Recycle;
2. Groundwater discharge (exfiltration);
3. Surface discharge; and
4. Groundwater discharge (deepwell injection).

This ranking is based on impact to site and immediate environs.

AIR EMISSION CONTROL TECHNOLOGIES AND EVALUATION

Sulfur Dioxide Control Alternatives

Sulfur dioxide control alternatives may be categorized as follows:

1. Burning of low-sulfur coal, whether naturally occurring or upgraded.
2. Burning high-sulfur coal with removal of sulfur dioxide from the flue gas. Flue gas desulfurization (FGD) can be accomplished through non-resource recovery methods or by regenerative processes.
3. Burning high-sulfur coal with removal of sulfur dioxide at the combustion stage.

Various possibilities for the implementation of each of these alternatives are presented in Table 28. In the same table, advantages and disadvantages of each strategy are detailed. Considerably more detail of air emission control strategies is presented in Chapters 8 and 9 of the Technical Support Document.

When capital and operating costs for available sulfur dioxide control technologies are compared, the desirability of using low-sulfur coal is clearly indicated. Low sulfur appears to be more economical than high

Table 28. Summary of Atmospheric Pollution Control System Alternatives

Pollutant	Control Scenario	Advantages	Disadvantages
Sulfur Dioxide	Low-Sulfur Coal (compliance coal)	Meets NSPS without additional controls	Availability questionable
		Lower cost than other alternatives	Lower sulfur dioxide content in flue gases affects ESP performance
		No waste products (other than fly and bottom ash)	
	Coal Beneficiation (mechanical washing, magnetic separation, and chemical separation)	Least cost of control alternatives	Water utilization at mine
		Meets NSPS without additional controls, in some cases	Magnetic and chemical separation in laboratory stages
		Reduces amount of waste when additional controls are used	Most coals that were beneficiated would still not meet NSPS
	Solvent Refined Coal	Low ash and sulfur product	Processes still in development stage
		Higher Btu/lb fuel; therefore, lower transportation costs	More expensive than all other alternatives
		Can meet NSPS without additional controls	

Table 28. Summary of Atmospheric Pollution Control System Alternatives (Continued, page 2 of 6)

Pollutant	Control Scenario	Advantages	Disadvantages
Sulfur Dioxide (continued)	Dynamic Emissions Controls	Can comply with AAQS and PSD increments	Prohibited by Federal regulation
		Very low-cost alternative	Will not meet NSPS
			Effectiveness uncertain
	FGD Throwaway Processes		
	1. Wet Lime/Limestone Scrubbing	Can remove up to 90 percent of sulfur dioxide	Produces large quantities of sludge that require large disposal area
		Considered commercially available	Potential for operation and maintenance problems
		Least expensive and most demonstrated of FGD processes	Potential for unit failure due to scrubber alone
			Lower plume exit temperatures resulting in greater ground level impact

Table 28. Summary of Atmospheric Pollution Control System Alternatives (Continued, page 3 of 6)

Pollutant	Control Scenario	Advantages	Disadvantages
Sulfur Dioxide (continued)	2. Double Alkali Scrubbing	Limited scaling, plugging, and erosion problems Proven successful in Japan on industrial boilers	Sludge produced has potential for water pollution Process is in research and development stages in the United States Loss of reactant (sodium hydroxide, ammonia or sodium sulfite) increases costs
	3. Limestone Addition	No semi-liquid sludge produced from process	Low sulfur dioxide removal efficiency does not allow NSPS to be achieved
	4. Fluidized Bed Combustion	Sulfur dioxide is removed in furnace and produces calcium sulfate (a dry waste) Heat transfer properties favorable	Not demonstrated on full-scale power plant Economics uncertain
	5. Dry Lime/Limestone Scrubbing	Dry waste product produced Potential for operation and maintenance minimized	Not demonstrated on full-scale power plant Rates of reaction must be adequately controlled

Table 28. Summary of Atmospheric Pollution Control System Alternatives (Continued, page 4 of 6)

Pollutant	Control Scenario	Advantages	Disadvantages
Sulfur Dioxide (continued)	FGD--Regenerative Processes		
	1. Magnesium Oxide Scrubbing	Small amounts of waste produced Potentially marketable by-product Reactant is recycled	Regeneration of reactant necessary More costly than wet limestone scrubbing Quantity of by-product may be too large to market
	2. Catalytic Oxidation	Small amounts of waste produced Potentially marketable by-product Reactant is recycled	More costly than wet limestone scrubbing Catalyst employed, contamination possible Quantity of by-product may be too large to market Corrosion problems in acid portion of facility

Table 28. Summary of Atmospheric Pollution Control System Alternatives (Continued, page 5 of 6)

Pollutant	Control Scenario	Advantages	Disadvantages
Sulfur Dioxide (continued)	3. Sulfuric Acid Scrubbing	Small amounts of waste produced Potentially marketable by-product produced	More costly than wet limestone scrubbing The high-quality gypsum may not be as economically attractive in the United States as in Japan Lower plume temperature can result in greater ground-level impact
	4. Sodium Sulfite Scrubbing	Small amount of waste produced Reactant is recycled Potentially marketable by-product	More costly than wet limestone scrubbing Lower plume temperature can result in greater ground-level impact
Particulate	Electrostatic Precipitation	Handles large quantities of flue gas at low pressure drop Removal efficiencies of 99.5 percent achievable Low maintenance costs Cost/Benefit more favorable than other control equipment	Highly dependent on coal utilized in boiler

Table 28. Summary of Atmospheric Pollution Control System Alternatives (Continued, page 6 of 6)

Pollutant	Control Scenario	Advantages	Disadvantages
Particulate (continued)	Fabric Filters	Potential for greater overall efficiency (especially in submicron range)	Larger space requirements than ESP's
		Can be utilized in dry lime/ limestone scrubbing applications	Limited design requirements
			Higher maintenance costs than ESP
	Wet Scrubbers	Can be combined with sulfur dioxide removal processes	Large volumes of water necessary
			Waste sludge produced with resultant disposal problems
			Lower plume temperature resulting in greater ground-level impact
			Excessive energy requirement
	Mechanical Separators	Very low capital, maintenance, and operating costs	Achievement of NSPS not possible

Note: Nitrogen dioxide control alternatives not summarized since the boiler can be designed to limit emissions.

Source: Environmental Science and Engineering, Inc., 1978.

sulfur coal as presented in Table 29. Costs also make FGD and regenerative processes unattractive. In the case of proposed Unit 4, the low-sulfur coal option would involve a present-worth savings of approximately $63 million 1978 dollars relative to the high-sulfur coal options.

Particulate Control Alternatives

Alternatives for the control of particulate emissions are also presented in Table 28 along with the advantages and disadvantages of each possibility. Electrostatic precipitation was chosen because high removal efficiencies could be achieved at the best cost/benefit ratio of the available alternatives.

Alternatives for Control of Oxides of Nitrogen

Control of nitrogen oxides from coal-fired units at the present time is accomplished by use of low nitrogen fuel or by modified combustion techniques. The status of current control technology is summarized in Table 30. Flue gas recirculation is considered to be ineffective as an NO_x control method when applied at coal-fired units. Reduced combustion-air preheating and steam or water injection are considered to be noncompetitive in comparison with the other alternatives presented. The other control alternatives can be used separately or in combination to effect compliance with present day NO_x standards. These alternatives present no great problems from a technical point of view. In fact, Combustion Engineering guarantees that its equipment can meet the 0.6 pound NO_x per million Btu's that was expected in the summer of 1977 (Ricci, 1977). These units are almost identical to their older design furnaces, except the new units are larger, and have over-fire air.

Table 29. Hypothetical Cost Comparison of Power Generation Units Utilizing Low-Sulfur and High-Sulfur Coal

Unit 4	Present Worth in Millions of October 1982 Dollars		Present Worth in Millions of April 1978 Dollars	
	Low-Sulfur Coal	High-Sulfur Coal	Low-Sulfur Coal	High-Sulfur Coal
Capital	469.3	556.0	292.2	346.2
Fuel	1,124.9	1,051.6	700.5	654.8
Operation and Maintenance	88.0	176.0	54.8	109.6
Total Present Worth	1,682.2	1,783.6	1,047.5	1,110.6

- -

Unit 5	Present Worth in Millions of April 1984 Dollars		Present Worth in Millions of April 1978 Dollars	
	Low-Sulfur Coal	High-Sulfur Coal	Low-Sulfur Coal	High-Sulfur Coal
Capital	359.3	427.9	191.1	227.5
Fuel	1,211.2	1,131.8	644.0	601.8
Operation and Maintenance	95.9	191.9	51.0	102.1
Total Present Worth	1,666.4	1,751.6	886.1	931.4

Sources: Florida Power Corporation, 1978.
Environmental Science and Engineering, Inc., 1978.

Table 30. Summary of Current NO_x Control Methods

Method	NO_x Reduction		
	Gas	Oil	Coal
Flue-gas recirculation	60%	20%	Not effective
Reduced combustion-air preheat	50%	40%	Not effective
Steam or water injection	60%	40%	Not effective
Staged combustion	55%	40%	40%
Low excess air	20%	20%	20%
Reduced heat-release rate	20%	20%	20%
Combined staging, low excess air, and reduced heat release	50%	35%	40%
Change to fuel with lower % N	Not effective	40%	20%

Source: EPA Report No. 650/2-74-066
U.S. Environmental Protection Agency, 1974.

Salt Drift Control

Efficient drift elimination will be a design criterion for both towers. The mass fraction of circulating salt water which will be carried out from the tower as drift will not exceed .0005 percent. This drift percentage will be a design specification for the cooling tower builder. Measurements of salt drift from towers at Chalk Point and B.L. England plants have shown that this drift rate is a feasible one (Monjoie and Sobel, 1976).

SOLID WASTE ALTERNATIVES AND EVALUATION

Primary sources of solid waste are (1) bottom ash from furnace, (2) fly ash from flue gas dust control equipment, (3) sludge disposal from non-regenerative sulfur dioxide removal system, (4) coal pulverizer rejects, and (5) facilities maintenance and operation wastes.

The expected quantity of solids for disposal based on both units operating will be approximately 784,000 kilograms (1,730,000 pounds) per day to 1,187,000 kilograms (2,620,000 pounds) per day, depending on average or peak generation.

Proposed disposal of both bottom ash and fly ash is by landfill; however, selling of bottom ash for base material, aggregate, or grit is also proposed. Alternative conveyances to the disposal site considered were a conveyor system and a truck disposal system. Alternatives for the construction of the proposed disposal area were lining or not lining. Costs vary depending on the type of liner. Lining could be accomplished by either an impermeable clay layer or a PVC liner overlain with earth cover. The costs would be $958,320 for the clay liner and $1,742,400 for PVC liners. Both liners would essentially accomplish the same purpose. Environmental impacts of an unlined pond would consist of ash leachate impacts contaminants, such as iron and sulfate, due to oxidation and reduction reactions taking place in the ash. Unlined ponds do not present as large a problem of how to get rid of stormwater runoff as do lined ponds, due to exfiltration. In the absence of site-specific data concerning subsurface flows, the best alternative may be to conduct testing of various landfill designs in order to choose the most appropriate.

Scrubber Waste Solids Disposal--If an FGD system is used, there is a potential for the generation of tremendous quantities of solid waste. Extensive research is being conducted to determine ramifications of FGD waste treatment methods (Jones, 1977). The alternative disposal methods are:

1. Pond disposal;
2. Landfill disposal;
3. Mine disposal;
4. Ocean disposal; and
5. Gypsum production.

No economic data is presently available for these disposal alternatives relative to the proposed Units 4 and 5. Pond, landfill, and mine disposal are similar and all share potential problems with settling. Leachate problems must also be considered. Ocean disposal is a consideration but ocean floor sedimentation, suspended solids, high sulfates, COD wastes, and trace contaminants all present potential problems similar to those posed by leachate for the land disposal alternatives.

CHAPTER III

DESCRIPTION OF THE PROJECT AREA

WATER SUPPLY AND DISCHARGE BODIES

GENERAL

The major surface water features in the vicinity of the proposed plant include the Withlacoochee River-Cross Florida Barge Canal Complex to the north, Crystal River to the south, and the Gulf of Mexico to the west (see Figure 16, p. 122). Numerous small ponds and wet depressions, as well as several small unnamed intermittent streams, are scattered about the area. Major streams in the area include the Withlacoochee River-Cross Florida Barge Canal Complex, Rainbow Springs, and the Crystal River. The major lake in the area is Lake Rousseau (an artificial impoundment on the Withlacoochee River).

There is no known consumptive use of freshwater surface bodies in the project area. However, both freshwater and saltwater surface bodies are heavily used for recreational purposes, and thus constitute substantial recreational and economic resources for the region. Consumptive uses are centered on the freshwater aquifer, although salt water is currently used as a once-through cooling source for Crystal River Units 1, 2, and 3.

In 1976, total groundwater withdrawals in Citrus County totaled 87.8 million liters per day (23.2 million gallons per day). Approximately half of this amount is used for irrigation and only 14.9 million liters per day (3.9 million gallons per day) is used for municipal water supply purposes. There is no concentration of withdrawals in any one area. Table 31 presents the present and projected future water demands in Citrus County. The total demand in the county by 2035 is expected to be about 197 million liters per day (52 million gallons per day),

Table 31. Present and Projected Future Water Demands in Citrus County in Millions of Liters Per Day (Millions of Gallons Per Day)

	Water Demand 1975	Projected Water Demand 1985	Projected Water Demand 2035
Municipal	14.8 (3.9)	25.7 (6.8)	87.4 (23.1)
Industrial*	31.0 (8.2)	29.1 (7.7)	7.6 (2.0)
Agricultural	42.0 (11.1)	45.4 (12.0)	101.1 (26.7)
Totals	87.8 (23.2)	100.3 (26.5)	196.1 (51.8)

*Excludes power plant demands.

Source: Water Resources Management Study, Hydrologic and Engineering Evaluation of the Four River Basins Area, West Central Florida, 1977.

roughly half of which will be for municipal demand and the other half for agriculture. Industrial demand, excluding power plants, is expected to be approximately 7.6 million liters per day (2 million gallons per day).

There are no public water supply systems within an 8-kilometer (5-mile) radius of the plant site. Three systems lie just outside the 8-kilometer (5-mile) radius. These are: the Yankeetown public water system [9.7 kilometers (6 miles) north of the site], the Indian Waters subdivision water system [9.7 kilometers (6 miles) southeast of the site], and the Thunderbird Mobile Park system [9.7 kilometers (6 miles) east-southeast of the site]. Combined capacity of the Yankeetown and Indian Waters Subdivision systems is about 1,625 liters (425 gallons) per minute.

REGULATORY CLASSIFICATION

The Crystal River Units 4 and 5 are located in the U.S. Geological Survey Basin 10J. Surface water in this basin is classified by Florida DER as Class III (Recreation, Propagation, and Management of Fish and Wildlife). There are no exceptions to the Class III water in the proposed plant site.

The water quality standards for Class III waters as set forth in FAC Chapter 17-3.121 were established to protect the beneficial use of the water from pollutant discharges. The standards include physical (e.g., transparency), chemical (e.g., nutrients, metals), and biological (e.g., bacteriological) parameters for both aquatic and marine systems. The water quality standards are administered by Florida DER; a listing of the standards is presented in the Technical Support Document.

The water quality criteria for Class III waters are shown in Table 31a. The extent of Class II waters in Citrus County, as determined by Florida DER in Chapter 17-3.161, is:

Table 31a. FAC 17-3 Water Quality Criteria--General

Parameters	Standards
Arsenic	0.05 mg/l
BOD_5	Shall not depress DO below 4 mg/l instantaneous and 5 mg/l 24-hour average
Chloride	250 mg/l (freshwater) <10% above ambient (marine)
Chromium (Hexavalent)	0.50 mg/l (effluent)
Chromium (Total)	1.0 mg/l (effluent)
Total	0.05 mg/l (receiving water)
Copper	0.5 mg/l
Detergents	0.5 mg/l
Dissolved Solids	500 mg/l (monthly average) 1,000 mg/l (instantaneous)
Fluorides--ionic	10.0 mg/l
Lead	0.05 mg/l
Oil and Grease	
Dissolved or Emulsified	5.0 mg/l
Undissolved	No visible oil to interfere with beneficial use
pH—Variation from natural background	<± 1.0
Range	6.0 to 8.5 (fresh)
Range	6.5 to 8.5 (marine)
Phenoloic Compounds	0.001 mg/l
Radium 226 and 228	<5 picu/l
Gross Alpha Particle Activity	<15 picu/l
Specific Conductance	<100% increase above ambient 500 umhos/cm (freshwater)
Turbidity	<50 JTU increase above ambient
Zinc	1.0 mg/l

Table 31a. Water Quality Criteria--Class III (17-3.121) Surface Waters Recreation, Propagation, and Management of Fish and Wildlife (Continued, Page 2 of 3)

Parameters	Fresh Waters	Marine Waters
Alkalinity as $CaCO_3$	>20mg/l	NA
Aluminum	NA	1.5 mg/l
Ammonia (un-ionized)	0.02 mg/l	NA
Antimony	NA	0.2 mg/l
Fecal Coliform	200 counts/100ml--monthly average 400 counts/100ml--10% of samples per month 800 counts/100ml--on any one day	
Total Coliform	1,000 counts/100ml--monthly average 1,000 counts/100ml--<20% of samples per month 2,400 counts/100ml--at any time	
Beryllium	0.11 mg/l if $CaCO_3$ hardness <150 mg/l) 1.10 mg/l if $CaCO_3$ hardness >150 mg/l)	
Biological Integrity	3 Hester-Dendy, 3 Ponar Grabs	
Shannon-Weaver D.I.	Substances $\geq$75% of established background	
Bromine	NA	0.1 mg/l
Bromate	NA	100 mg/l
Cadmium	1.2 ug/l if hardness >150 mg/l 0.8 ug/l if $CaCO_3$ <150 mg/l	5.0 ug/l
Chlorine (total residual)	0.1 mg/l	0.01 mg/l
Copper	30 ug/l	15 ug/l
Cyanide	5.0 ug/l	5.0 ug/l
Dissolved Gasses	110% saturation value	
Dissolved Oxygen	5.0 mg/l	5.0 mg/l (24-hr avg.)
	NA	4.0 mg/l (instantaneous)
Fluoride	NA	5.0 mg/l
Hydrogen Sulfide (undissociated)	0.002 mg/l	0.002 mg/l
Iron	1.0 mg/l	0.3 mg/l
Lead	30 ug/l	50 ug/l (general)
Mercury	0.2 ug/l	0.1 ug/l
Nickel	0.1 mg/l	0.1 mg/l
Nutrients	Waters should be protected from man-induced nutrient enrichment	

Table 31a. Water Quality Criteria--Class III (17-3.121) Surface Waters Recreation, Propagation, and Management of Fish and Wildlife (Continued, Page 3 of 3)

Parameters	Fresh Waters	Marine Waters
Pesticides and Herbicides		
Aldrin plus Dieldrin	0.003 ug/l	0.003 ug/l
Chlordane	0.01 ug/l	0.004 ug/l
DDT	0.001 ug/l	0.001 ug/l
Demeton	0.1 ug/l	0.1 ug/l
Endosulfan	0.003 ug/l	0.001 ug/l
Endrin	0.004 ug/l	0.004 ug/l
Guthion	0.01 ug/l	0.01 ug/l
Heptachlor	0.001 ug/l	0.001 ug/l
Lindane	0.01 ug/l	0.004 ug/l
Malathion	0.1 ug/l	0.1 ug/l
Methoxychlor	0.03 ug/l	0.03 ug/l
Mirex	0.001 ug/l	0.001 ug/l
Parathion	0.04 ug/l	0.04 ug/l
Toxaphene	0.005 ug/l	0.005 ug/l
pH—Variation from natural background waters	± 1.0	± 1.0 (coastal) ± 0.2 (open water)
Range	6.0 to 8.5	6.5 to 8.5
Phosphorus--elemental	NA	0.1 ug/l
Phthlate Esters	0.003 mg/l	NA
Polychlorinated Biphenyls	0.001 ug/l	0.001 ug/l
Selenium	0.025 mg/l	0.025 mg/l
Silver	0.07 ug/l	0.05 ug/l
Transparency	<10% reduction of compensation depth from background	
Zinc	30 ug/l	1.0 mg/l (general)

Source: Florida Department of Environmental Regulation, 1977.

> "Tidal creeks and coastal waters--Latitude 28°54'N, south to Hernando County Line with the exception of waters which are bounded by and including the Crystal River on the north, St. Martin's River on the south, barrier islands on the west, and the mainland on the east."

Additional exceptions to Class III waters in the county are the Chassahowitza Wildlife Refuge and the St. Martin's Marsh State Aquatic Preserve.

CHARACTERISTICS: CHEMICAL AND ECOLOGICAL

The upper surface of the Floridan Aquifer, which would constitute both the potable water source for the plant and the receiving body for possible leachates, lies at a depth of 1.2 to 2.7 meters (4 to 9 feet) under the wellfield site and 0 to 1 meters (0 to 4 feet) under the plant site. In the vicinity of the wellfield, the confined Floridan Aquifer appears to be separated from the unconfined surficial (water table) aquifer by a somewhat impermeable layer. Therefore, fluctuations in the Floridan Aquifer may have a relatively minor influence on levels of the surficial water table and, consequently, the vegetation in the area. At the plant site and along the coast, however, the Floridan Aquifer is essentially the water table aquifer, and its characteristics strongly influence the vegetation of the surface systems.

Water from the Floridan Aquifer also discharges in an upwelling fashion in the coastal wetlands, estuaries, and springs of the region. Discharge of springs such as those creating Crystal River and the health and survival of the coastal forests are all dependent upon the flow of this aquifer.

Table 32 presents a water chemistry summary of the aquifer at the proposed wellfield site, the existing wellfield site, and the proposed plant site (Figure 11). Other than seasonal variations, there appears

Table 32. Summary of Water Chemistry Analyses of the Floridan Aquifer (Ranges Given)

	Conductivity (micromhos/cm)	TDS (mg/l)	TSS (mg/l)	Hardness as $CaCO_3$ (ppm)	Ca as $CaCO_3$ (ppm)	Chloride (ppm)	Mo Alkalinity (ppm)	pH	Sulphates (mg/l)	Sodium (mg/l)
Proposed Plant Site	385–590	204–328	6–155	171–243	65–88	8–22	103–159	7.1–7.5	—	—
Existing Wellfield Site	410–485	—	<5	232–256	59–173	9–13	13–237	7.4–7.8	5	9–10
Proposed Wellfield Site	2260–2632	2110–2962	—	—	—	41–60	—	—	1226–1575	—

Sources: Geraghty and Miller, Inc., 1978.
Black & Veatch, 1977.
Florida Power Corporation, 1978.

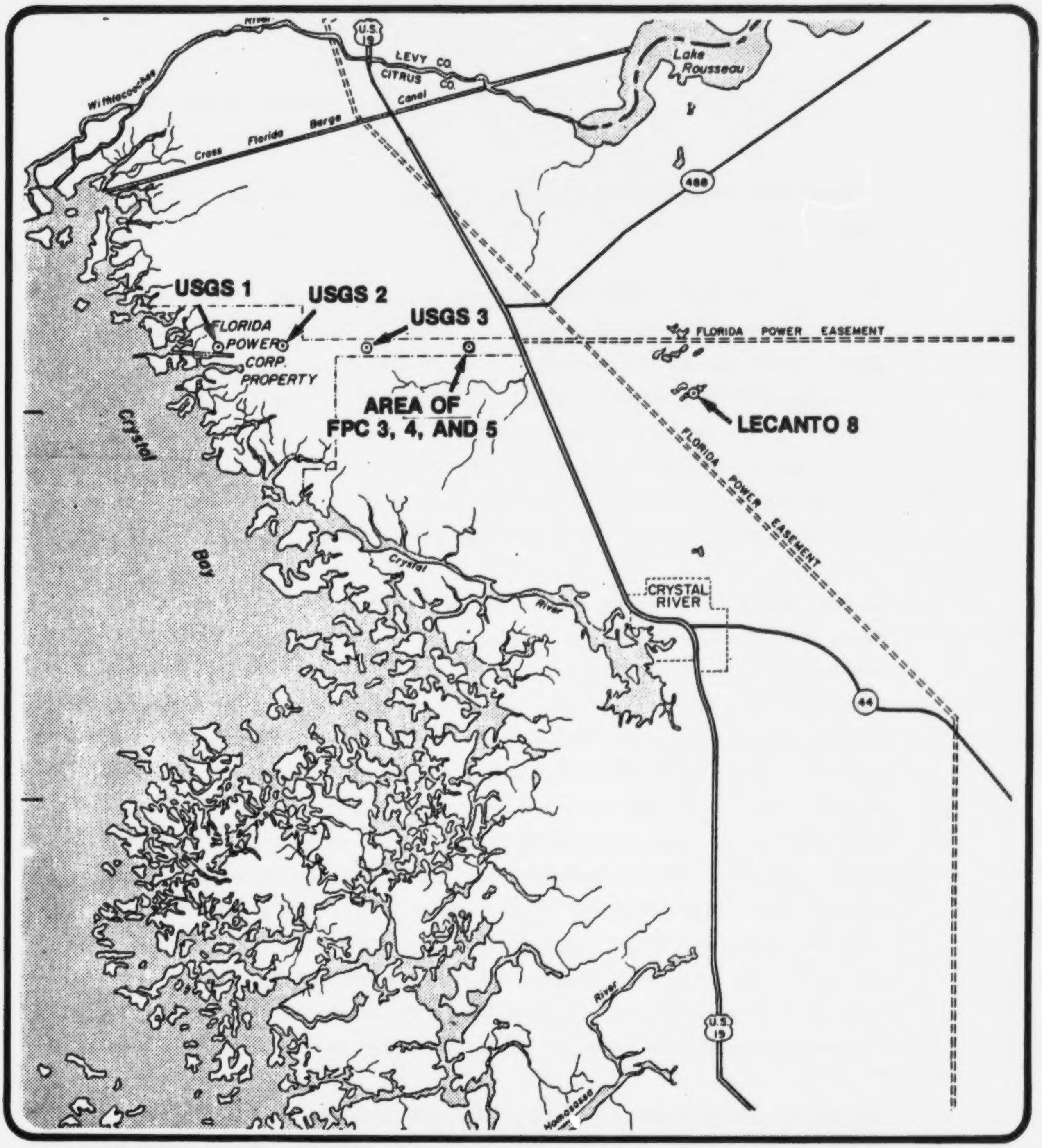

Withlacoochee River
Cross Florida Barge Canal
U.S. 19
LEVY CO.
CITRUS CO.
Lake Rousseau
488
USGS 1
USGS 2
USGS 3
FLORIDA POWER CORP. PROPERTY
AREA OF FPC 3, 4, AND 5
FLORIDA POWER EASEMENT
LECANTO 8
FLORIDA POWER EASEMENT
Crystal Bay
Crystal River
CRYSTAL RIVER
44
River
U.S. 19
Homosassa

Figure 11
LOCATION OF WELLS
USGS 1, USGS 2, USGS 3, LECANTO 8, AND FPC 3, 4, AND 5

SOURCE: GERAGHTY AND MILLER, INC., 1977

N

0 1 2
SCALE IN MILES

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

to have been no significant change in water quality in the period from 1966 to 1977.

Water quality in the Gulf waters of this area is relatively good, although some turbidity does occur at times of strong wind or tidal flows. Total solids are markedly lower in the discharge basin than at the mouth of the discharge canal. Nitrogen, chlorophyll a, and silica concentrations tend to increase near sources of freshwater or runoff inflow and/or following rainfall. Phosphorus, on the other hand, reached highest levels in the outer bay. Available water quality data for the existing intake canal are presented in Table 33.

In the immediate vicinity of the proposed power plant site are three major aquatic-related habitat types: salt marsh, coastal hydric hammock, and freshwater marsh. The coastal zone is dominated by salt marsh. Within the salt marsh, Juncus roemerianus (black needlerush) and Spartina alterniflora (cordgrass) are the two principal floral types present. These grasses are of major importance in primary production, the initial link of any food web--the capture and conversion of energy from the sun to chemical-bond energy which, in turn, can be used by other organisms. There are two major food webs these grasses support; one involves those organisms which feed on the living plant (herbivores) and the second are those which feed on the detrital material produced by the plant (detritivores) (Keefe, 1972). The marsh also plays a major role as a nursery ground for fish and is an important habitat for various invertebrates, a major food source for some fish species.

The intake and discharge canals extend out into the Gulf beyond the salt marsh to open water where numerous estuarine organisms have access to the canals. These organisms can be impacted by impingement (contact with the intake screens), entrainment (passage through the power plant), or by thermal or chemical changes.

Table 33. Water Quality, Crystal River Plant Station D, Intake Canal, Gulf of Mexico

Date	Salinity 0/00	PO_4-P Parts per 10 million	NO_3-N Parts per 10 million	NH_3-N Parts per 10 million	SiO_2-Si pp ppm	NO_2-N ppb	Organic C ppm
11/6/73	28.117	0.19	0.103	<0.05	0.591	1.0	3.7
11/20/73	29.25	0.08	0.021	0.46	0.367	0.5	6.4
12/3/73	27.627	0.24	0.106	0.36	0.736	7.9	3.15
12/18/73	25.587	0.34	0.066	0.03	0.509	0.8	3.41
1/3/74	22.158	0.18	0.044	0.52	0.295	1.4	4.39
1/14/74	23.873	0.10	0.012	0.05	0.563	0.3	2.87
1/28/74	23.207	0.482	0.008	0.26	0.737	0.2	5.63
2/12/74	23.418	0.14	0.029	0.37	0.755	0.3	6.6
2/27/74	20.563	0.023	No data	0.19	0.377	1.0	6.9
3/13/74	26.484	0.113	0.057	0.56	0.280	0.3	No data
3/26/74	20.075	0.09	0.004	0.68	0.850	No data	6.3
4/9/74	23.121	0.14	0.012	0.44	1.012	0.9	7.6
4/24/74	24.040	0.28	<0.001	0.38	0.805	0.8	12.3
5/7/74	26.046	0.14	0.006	0.43	0.757	0.4	4.9
5/22/74	26.060	0.18	0.022	0.36	1.01	0.3	7.3
6/4/74	25.189	0.21	0.037	0.53	0.966	0.1	6.9
6/21/74	27.627	0.33	0.046	0.35	1.283	0.7	5.9
7/3/74	20.342	<0.01	0.662	1.94	1.252	<0.1	6.3
7/19/74	24.60	<0.01	0.478	0.25	1.522	<0.1	4.9
7/31/74	21.0	12.02	0.630	0.90	0.659	<0.1	8.0
8/16/74	23.8	5.12	0.482	0.51	1.145	<0.1	7.1
8/28/74	25.6	1.71	0.11	0.34	0.410	<1	5.7
9/13/74	25.8	0.18	0.08	0.22	0.184	<1	5.1

Source: Environmental Science and Engineering, Inc., 1977 (based on Florida Power Corporation, 1976).

The ecology of the water of the discharge canal is thus vastly different from that found in the open estuary or intake canal because of the loss of various elements of the aquatic food chain and a general decrease in species diversity due to the impingement, entrainment, and thermal impacts, and strong currents at the three existing units. The organisms which remain in the discharge canal constitute a shift in species composition towards more mobile, free-swimming forms. Most of these species would be present as adults who can swim strongly against the current. Due to the swift current and the effects of Units 1, 2, and 3, larval fishes would be much less numerous than in other areas of the estuary. On-site observations indicate that the most common and/or abundant fishes of the discharge canal tend to be larger, schooling forms, which include the following:

Sharks (eps. *Carcharinus limbatus*, uncommon)
Mullet (*Mugil* spp.)
Ladyfish (*Elops saurus*)
Tidewater silverside (*Menidia beryllina*)
Pinfish (*Lagodon rhomboides*)
Spotted seatrout (*Cynoscion nebulosus*)
Atlantic croaker (*Micropogon undulatus*)
Red drum (*Sciaenops ocellata*)
Spot (*Leiostomus xanthurus*)
Silver perch (*Bairdiella chrysura*)
Jacks (*Caranx* spp.)

ATMOSPHERIC CONDITIONS

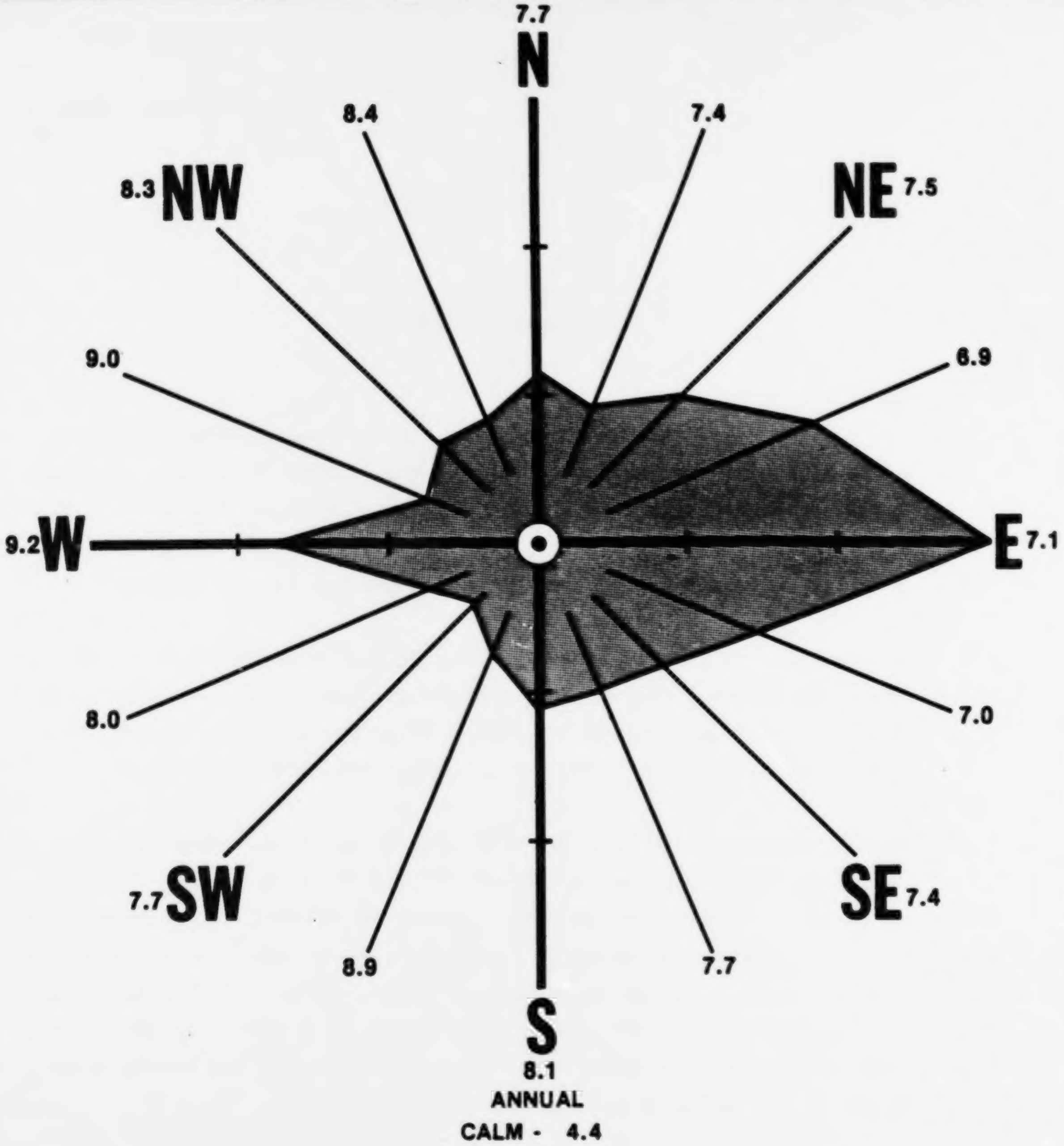
CLIMATE: METEOROLOGY

The Florida Power site is characterized by dry winters and rainy summers, high humidity, and seasonal patterns of wind direction. The mean annual temperature is 21.0°C (69.8°F). In summer the climate is influenced primarily by sea breezes from the Gulf of Mexico and convective heating, while in winter, frontal activity dominates the weather.

Rainfall in the year 1975 was 1,078 mm with 62 percent of the rainfall occurring between June and September, when thunderstorm activity is at a peak. Thirty-year averages at nearby Cedar Key indicate that the mean yearly rainfall is 20 to 40 percent higher than that for 1975.

Thunderstorms are the most frequent severe storms affecting the site. These storms occur on an average of 80 days per year, nearly 60 percent of which occur from June through August. The probability of other forms of severe weather occurring at the site is quite low. For example, the probability of a tropical cyclone occurring in any year is 1 in 5, and a hurricane, 1 in 17. The probability of a tornado hitting a specific point on the site is once every 1,250 years. Almost all severe storms occur in the period from June through October.

On an annual basis, winds at the site prevail from the east to east-northeast. However, substantial seasonal deviations occur as appreciable sea breezes blow from the west and southwest in summer, and more northerly winds occur during frontal activity in the cooler months (see Figure 12). Wind speed is generally low, less than 10 knots, but easterly, northeasterly, and westerly winds are often higher.



TICK MARKS ON ROSE REPRESENT 4%.
AVERAGE WIND SPEED IN KNOTS IS GIVEN FOR EACH WIND SECTOR.

Figure 12
ANNUAL WIND ROSE FOR TAMPA, FLORIDA,
1971 - 1975

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1978

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The stability of the atmosphere, as determined by Pasquill's method (defined by wind speed, cloud cover, cloud ceiling, and solar elevation) is generally least stable and the resultant mixing depths generally greatest in the summer months. This mixing depth (inversion layer) is the height below which local low-level air masses do not mix with the higher, continuously circulating air masses. This means that the probability of influencing air quality will be greatest in the cool months when the mixing layer is lowest, and the plume has the least chance of dispersing in the upper atmosphere. However, the relatively high velocity sea breezes in the summer months are believed to have higher potential for causing maximum impact cases due to fumigation.

CURRENT AIR QUALITY

The ambient air quality of an area can be described in terms of quantitative standards. These standards, called Ambient Air Quality Standards (AAQS), were promulgated by regulatory agencies to protect the health and welfare of the general public. The applicable AAQS's which were established by the State of Florida are presented in Table 34. The major AAQS's to be evaluated for a fossil fuel field steam electric plant, located in a rural area, are those for total suspended particulate matter (TSP) and sulfur dioxide. Compliance with these standards is evaluated at ground level.

Analysis of the baseline air quality is based upon both ambient air monitoring at four stations during 1977 and 1978, and atmospheric dispersion modeling. Monitoring results at four stations ranging from about 5 kilometers (3.1 miles) to 14 kilometers (8.7 miles) indicate that both TSP and sulfur dioxide levels are currently within AAQS standards, and that any new sources of air emissions would have a considerable margin of compliance (Table 35).

Dispersion modeling for air quality was performed for establishment of baseline levels of sulfur dioxide and TSP to meet the requirements for Prevention of Significant Deterioration (PSD). This baseline determined

Table 34. State of Florida Ambient Air Quality Standards (ug/m^3)

Pollutant	Annual Maximum 3-Hour Concentration	Annual Maximum 24-Hour Concentration	Annual Mean Concentration
Total Suspended Particulate		150	60*
Sulfur Dioxide	1,300	260	60†

*Geometric Mean
†Arithmetic Mean

Source: Florida Administrative Code, Chapter 17-2.

Table 35. Summary of TSP and SO_2 Ambient Air Quality Data (ug/m^3), Florida Power Corporation, Crystal River Site.

Pollutant	Station Number	Maximum 3-Hour Concentration	Maximum 24-Hour Concentration	Mean
Total Suspended Particulate	1	—	110	30*
	2	—	80	25*
	3	—	94	46*
	4	—	78	30*
Sulfur Dioxide (Non-continuous)	1	—	16	4†
	3	—	47	8†
Sulfur Dioxide (Continuous)	2	416	105	15†
	4	192	58	8†

*Geometric mean
†Arithmetic mean

Source: Environmental Science and Engineering, Inc., 1978.

the maximum (highest) possible concentrations which currently would exist, including the current fossil fuel-fired units, Crystal River Units 1 and 2.

Baseline concentrations for the annual average, 24-hour, and 3-hour periods at the plant site and at the Class I area Chassahowitzka National Wilderness Area are shown in Table 36. Since each of these areas is currently well within the AAQS standards, the PSD regulations, concerning the degree by which the new sources can raise this background level, will be a more severe limitation on the proposed units than will the AAQS standards.

Table 36. Maximum Estimated Baseline Concentrations (ug/m^3) in the Vicinity of Florida Power Corporation's Crystal River Site, and at the Chassahowitska Wilderness Area Based on Units 1 and 2 at 2.7 Percent Sulfur Fuel Oil and TSP Emissions at 0.1 lb/10^6 Btu.

Pollutant	Averaging Time		
	Annual	24-Hour	3-Hour
Sulfur Dioxide			
Baseline Class II	5	65	374
Baseline Class I (Chassahowitska Wilderness Area)	1	30	100
AAQS	60	260	1,300
Particulate Matter*			
Baseline Class II	30	32	NA
Baseline Class I (Chassahowitska Wilderness Area)	30	31	NA
AAQS	60	150	

*Background TSP concentration of 30 ug/m^3 applied to modeling results (geometric standard deviation of 1.4).

Notes: An annual geometric mean of 60 corresponds to an arithmethic mean of 64 ug/m^3 and a geometric standard deviation of 1.4.

All short-term AAQS cannot be exceeded more than once per year.

Source: Environmental Science and Engineering, Inc., 1978.

LAND

CHARACTERISTICS: TOPOGRAPHY, PHYSIOGRAPHY, SEISMICITY

The geomorphology in this area is defined by two well-developed coastal marine terraces which parallel the coast and mark the landward extent of two Pleistocene seas, the Pamlico and Wicomico, with shorelines at the 7.6 meter (25 feet) and 30 meter (100 feet) contours above mean sea level, respectively. The site is located within the Pamlico marine plain, which extends about 13 to 16 kilometers (8 to 10 miles) inland.

The surface of the proposed site is comprised of a thin layer (less than 3 meters) of sands overlying a broad, greatly fractured, limestone shelf, which is the top of the Floridan Aquifer. The top of the Floridan Aquifer lies at the land surface in some places. The Floridan Aquifer is the upper sequence of rock formations underlying the study area and contains large volumes of fresh water, which give rise to numerous springs scattered throughout the coastal hammock, and feed most of the streams in the area.

The Floridan Aquifer in the study area is composed of the Ocala Group, Avon Park Limestone, and Lake City Limestone, with extensive solution cavities. The most extensive solution zones are in the Ocala Group and at the contact between the Ocala Group and the Avon Park Limestone.

A well-developed fracture system is present throughout the area, with the major axes striking northwest/southeast. The westernmost extension of mapped faulting lies 4.8 kilometers (3 miles) east of the plant site. Photogeologic studies, test borings, and a seismic refraction survey have eliminated the possibility that faulting exists beneath the proposed plant site.

A seismic study by Weston Geophysical Research, Inc. indicates that the area of significant seismic activity which is closest to the site is Charleston, South Carolina. The site also is located in Seismic Zone 1 (Department of Army, Navy, and Air Force, 1973) which is rated as probable to expect only minor damage. Therefore the area is considered seismically stable.

Soils on the site are generally very thin, nearly level, and poorly drained. The dominant soil association is the sandy Broward-Boca association, with freshwater swamp and saltwater marsh soils occurring on the western portion of the property.

Because of the thin soils, extreme flatness of the site, and the proximity to the Gulf of Mexico, the area is subject to flooding. The most extensive flooding to be expected at the site will be produced by abnormally high tides resulting from hurricane surge and over-riding wind waves. The "mean annual flood" elevation is about 1 meter (3 feet) above mean sea level, and the 100-year flood elevation at the site is approximately 3.4 meters (11 feet) above mean sea level.

CURRENT USE: AGRICULTURAL, INDUSTRIAL, RESIDENTIAL, COMMERCIAL

Figure 13 shows the present land use within an 8-kilometer (5-mile) radius of the proposed plant site. This 8-kilometer radius lies primarily within the unincorporated area of Citrus County with only a small portion extending into the incorporated areas of Yankeetown and Inglis in Levy County. Present land use within a 6.4 kilometer (4 mile) radius consists largely of undeveloped areas (74 percent) about one-half of this area being the Gulf of Mexico. Pine plantation comprises 15 percent, other agriculture (mainly pasture), 5 percent; and residential and commercial uses combined, less than 1 percent. Industrial uses cover about 6 percent of the area, with the Florida Power Corporation property accounting for about 1 percent of the 6 percent, and the Cross Florida Barge Canal another 2 percent.

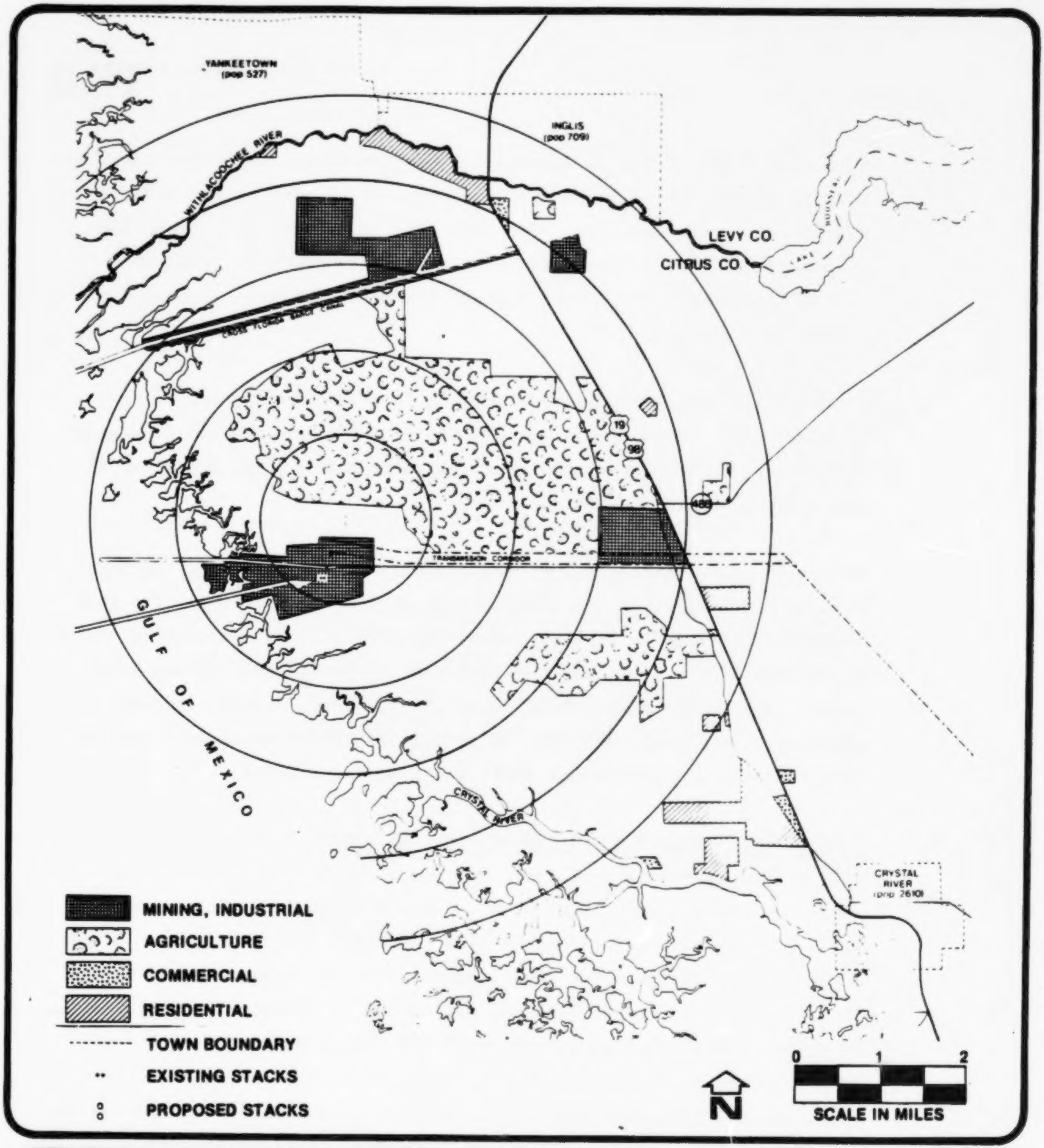
YANKEETOWN (pop 527)
INGLIS (pop 709)
WITHLACOOCHEE RIVER
LEVY CO.
CITRUS CO.
LAKE ROUSSEAU
CROSS FLORIDA BARGE CANAL
19
98
488
TRANSMISSION CORRIDOR
GULF OF MEXICO
CRYSTAL RIVER
CRYSTAL RIVER (pop 2610)
MINING, INDUSTRIAL
AGRICULTURE
COMMERCIAL
RESIDENTIAL
TOWN BOUNDARY
EXISTING STACKS
PROPOSED STACKS
N
0
1
2
SCALE IN MILES

Figure 13
PRESENT LAND USE (5 MILE RADIUS)

SOURCE: WITHLACOOCHEE REGIONAL PLANNING COUNCIL
ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1977

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The largest concentration of residential uses within 8 kilometers (5 miles) of the proposed stack location is approximately 50 hectares (120 acres) of unincorporated Citrus County and portions of Yankeetown and Inglis along the north and south banks of the Withlacoochee River.

According to the Withlacoochee Regional Planning Council, no major land use changes are expected to occur within the 8-kilometer (5-mile) radius over the next 30 years. The proposed project would convert primarily vacant land to industrial use.

In the future, some commercial development will probably take place along U.S. Highway 19-98, but will be concentrated at the outer perimeter of the 8-kilometer (5-mile) radius near the municipalities of Crystal River and Inglis.

An increase in residential development can also be expected, particularly along the Withlacoochee River from U.S. Highway 19-98 to Lake Rousseau. About 1,940 hectares (4,800 acres) in this area have been subdivided and improved for residential development, but a recent survey revealed only ten homes and no signs of new construction.

All but 260 hectares (650 acres) of agricultural land within a 4.8-kilometer (3-mile) radius of the plant is zoned for industry.

TERRESTRIAL ECOLOGY

The present land uses of the area influence both the distribution and abundance of the vegetation and the wildlife. The primary natural factors affecting existing ecosystems are soil and moisture factors and the proximity to the coast (see Figure 14). Numerous areas occur throughout the Florida Power property where the top layer of limestone shelf has been dissolved or subsided and has left depression-like sinks up to two feet in depth. About half of the site has recently been timbered and is in an early successional growth. The remainder of the site has been modified by construction of logging roads, some land clearing, and

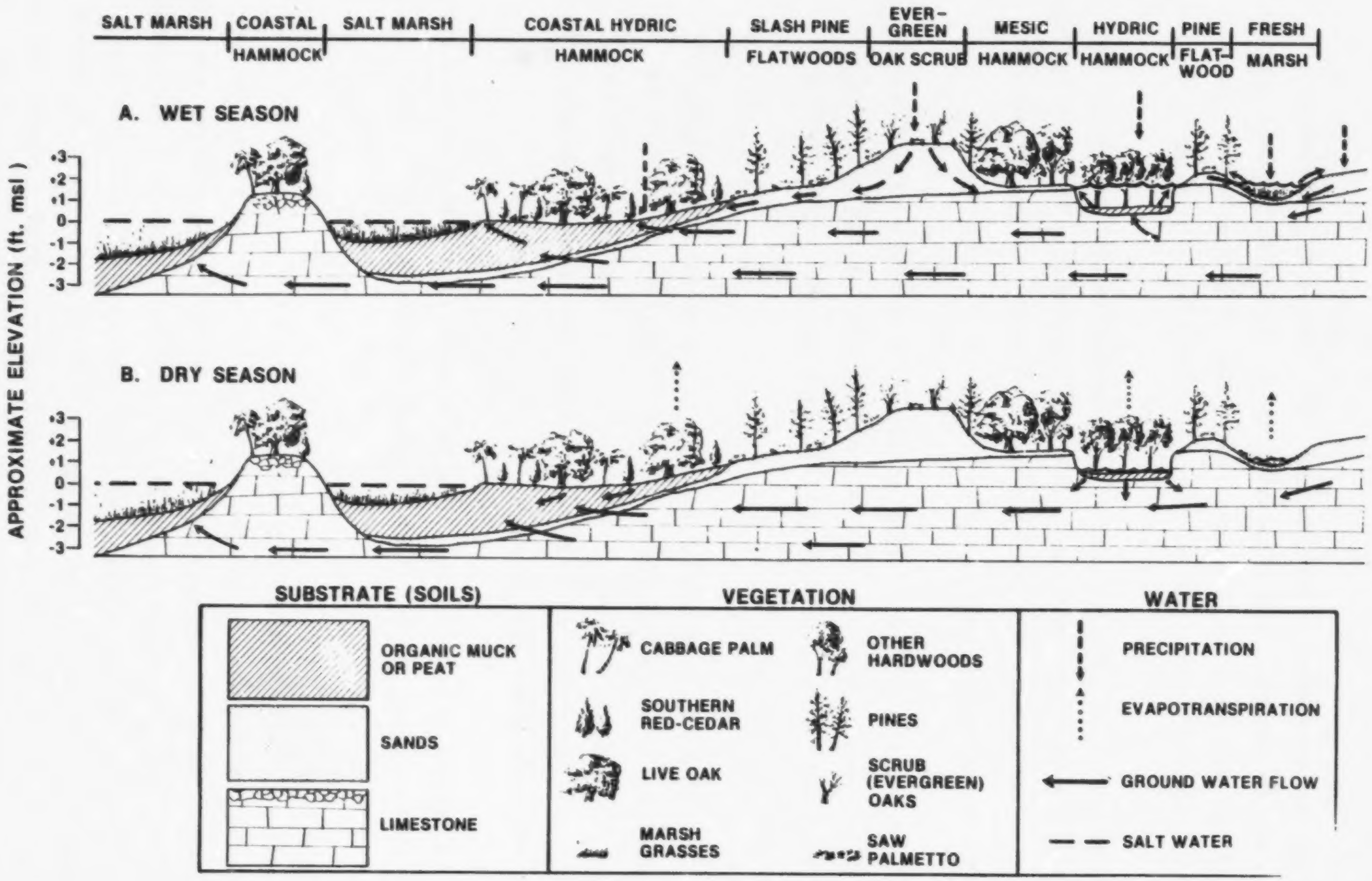
SALT MARSH
COASTAL HAMMOCK
SALT MARSH
COASTAL HYDRIC HAMMOCK
SLASH PINE FLATWOODS
EVER-GREEN OAK SCRUB
MESIC HAMMOCK
HYDRIC HAMMOCK
PINE FLAT-WOOD
FRESH MARSH
A. WET SEASON
B. DRY SEASON
APPROXIMATE ELEVATION (ft. msl)
+3
+2
+1
0
-1
-2
-3
SUBSTRATE (SOILS)
ORGANIC MUCK OR PEAT
SANDS
LIMESTONE
VEGETATION
CABBAGE PALM
SOUTHERN RED-CEDAR
LIVE OAK
MARSH GRASSES
OTHER HARDWOODS
PINES
SCRUB (EVERGREEN) OAKS
SAW PALMETTO
WATER
PRECIPITATION
EVAPOTRANSPIRATION
GROUND WATER FLOW
SALT WATER

Figure 14
CONCEPTUALIZED PLANT/SOIL/WATER RELATIONSHIPS OF THE PROPOSED PLANT SITE

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1977

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construction of power line corridors; however, the extent of these disturbances is not considered to be irreversible.

Vegetation composition of the Florida Power property (see Figure 15) is generally typical of the region and includes freshwater marsh, pine plantation, pine flatwoods, upland and wetland hardwood hammocks, evergreen oak scrub, and ruderal (cleared) areas. The plant site can be divided into four general geographic areas based upon a combination of elevation, soils substrate, and general appearance of the dominant vegetation. The western section of the property is bordered by a belt of coastal hydric hammock, which is an extension of the coastal wetland forest south of the existing units. These forests have received the least disturbance of any in the area and are fairly old-age stands.

Most of the northern half of the site is slash pine flatwoods with scattered areas of evergreen oak scrub and small freshwater marshes. Most of the on-site pine flatwoods were cut over about 15 years ago. Natural reseeding in these areas has produced a young dense regrowth.

The southern half of the site is dominated by hammock communities of the southern mixed hardwood association (Monk, 1965). In these areas, a large amount of interspersion occurs between hydric and mesic hardwoods hammock. The hydric hammock variant occurs in those depressed areas where the surface layer of limestone is missing. Although these communities are not mature, the vegetation can be considered climax since the dominant overstory trees are reproducing. The transmission corridor, which borders the southern edge of these plant communities, contains primarily ruderal vegetation.

The wildlife of the area is greatly influenced in diversity and abundance by the presence of the salt marsh to the west and the bordering continuous coastal hydric hammock forest. These plant community interfaces have promoted great local diversity in habitat and species of vertebrate animals.

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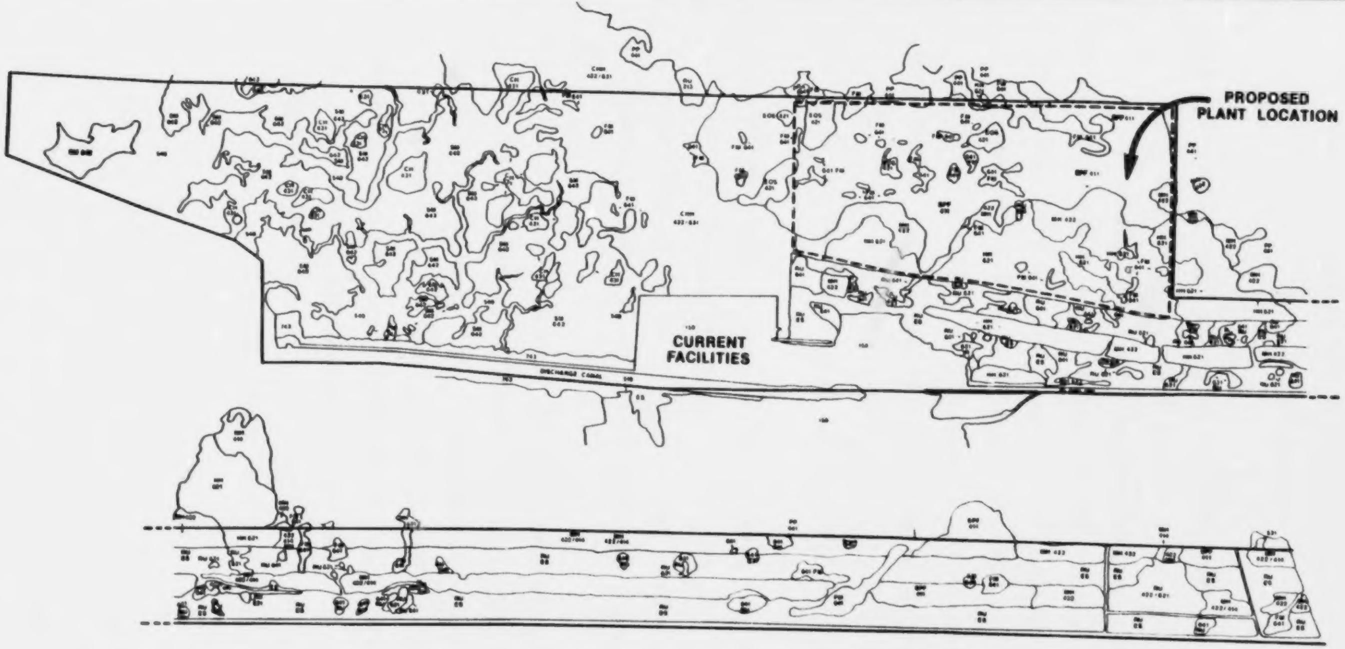

SYMBOL	CLASSIFICATION	NUMBER	FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM NAME
SM	Saltwater Marsh	642	Saltwater Marsh
FM	Freshwater Marshes and Prairies	641	Freshwater Marsh
SPF	Slash Pine Flatwoods	411	Pine Flatwoods
EOS	Evergreen Oak Scrub	421	Xeric Oak Hardwood Forest
MH	Mesic Hammock	422	Other Hardwood Forest
		414	Other Coniferous Forest
HH	Hydric Hammock	631	Freshwater Swamp
AL	Altered Lands	742	

SYMBOL	CLASSIFICATION	NUMBER	FLORIDA LAND USE AND COVER CLASSIFICATION SYSTEM NAME
CU	Communications & Utilities	100	
CH	Coastal Hammock	431	Mixed Forest
CHH	Coastal Hydric Hammock *	422	Other Hardwood Forest
		631	Mixed Wetland Forest
PP	Pine Plantation	441	Coniferous Planted Forest
RU	Ruderal **		Several Types
ES	Early Successional		No Equivalent
——	Water	500's	Water

* Type is derived from Hydric Hammock, North Florida type (from Wharton, et. al, 1976).

** Ruderal can include early successional, fresh water marsh, shrub swamp, pasture, or other agricultural systems.

Figure 15

VEGETATION MAP OF PROPOSED PLANT SITE AND ACCESS CORRIDOR

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1978

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The animal community of the property is characterized by ubiquitous types as well as a number of exclusives (species occurring in a single habitat). Ubiquitous forms (e.g., mourning dove, raccoons, and armadillo) occur throughout the site. Larger mammals such as white-tailed deer, feral swine, river otter, and gray fox are found in the vicinity and many utilize the various ecosystems.

Important animal species of the site include game animals and resident fur-producing species. Common small game species consist of bobwhite quail, mourning dove, cottontail rabbit, and gray squirrel. Population of white-tailed deer and feral swine are present in the area. The land seasonally attracts a few migratory species such as woodcock, common snipe, and rails. A variety of fur-bearing mammals, e.g., raccoon, river otter, and fox can be expected on the site.

SOCIOECONOMICS OF AREA

SITE LOCATION AND POLITICAL BOUNDARIES

Figure 16 shows the 5-mile (8-kilometer)* radius area from the proposed plant site with concentric circles of 1-, 2-, 3-, 4-, and 5-mile radii centered at the stack location. The 5-mile radius area lies primarily within the unincorporated area of Citrus County with only a small portion extending into the southern part of Levy County. Also, due to the coastal location of the proposed site, approximately one-third of the 5-mile area extends into the Gulf of Mexico, and much of the land lying to the south of the proposed site is marshland, which is unsuitable for development. The property holdings of Florida Power at the proposed site lie wholly within the 5-mile radius area and account for approximately 13.5 percent of the total land area within the radius area.

The only incorporated areas lying within 5 miles of the proposed facilities are small portions of Yankeetown and Inglis, which are both located in Levy County. Construction and operation of the proposed facilities will have little effect on these two municipalities due to their small size and lack of any significant support services and facilities.

The effects of the construction and operation of the proposed facilities will primarily be centered in Citrus County and particularly in the area of the City of Crystal River which is located approximately 8 miles (13 kilometers) southeast of the site. In the proximity of the proposed site, Crystal River is the only municipality of sufficient size to offer supportive services and facilities such as food stores, restaurants, gasoline service stations, retail shopping establishments, and housing.

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*For the Socioeconomics section to be consistent with the wording of Florida regulations, numbers referring to distances are expressed in English measurements with the metric equivalents in parentheses.

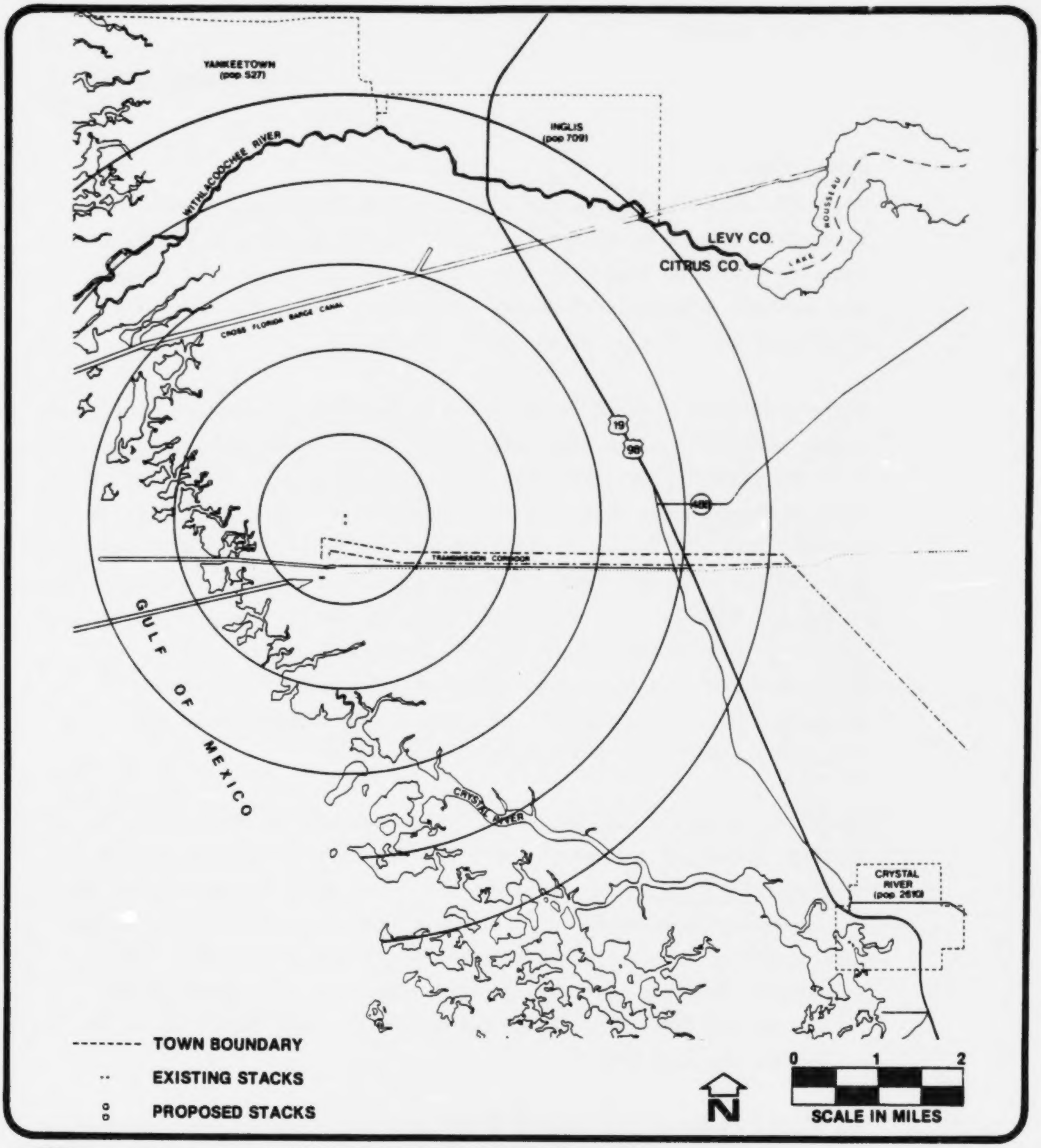
YANKEETOWN
(pop 527)
INGLIS
(pop 709)
WITHLACOOCHEE RIVER
LEVY CO.
CITRUS CO.
LAKE ROUSSEAU
CROSS FLORIDA BARGE CANAL
19
98
488
TRANSMISSION CORRIDOR
GULF OF MEXICO
CRYSTAL RIVER
CRYSTAL
RIVER
(pop 2610)
TOWN BOUNDARY
EXISTING STACKS
PROPOSED STACKS
N
0
1
2
SCALE IN MILES

Figure 16
SITE LOCATION (5 MILE RADIUS)

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1977

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POPULATION

Table 37 lists the populations of Citrus and Levy Counties and their incorporated areas as of the April 1, 1970 Census and the July 1, 1977 estimates from the Division of Population Studies, Bureau of Economic and Business Research, University of Florida, (these estimates are considered the official estimates in the state).

Citrus County is located in the northern portion of Florida's West Coast growth corridor and has been experiencing substantial population growth over the past 27 years, primarily due to in-migration. From 1960 to 1970, the population in Citrus County increased from 9,268 to 19,196 persons, representing an increase of over 107 percent or almost three times faster than the state's overall population increase of 37 percent during the same decade. The county has only two incorporated areas, the City of Crystal River and the City of Inverness. Since 1970, Citrus County has been the fastest-growing county in the state in terms of percentage population change. The majority of population growth in the county has occurred in its unincorporated areas.

According to projections published by the Division of Population Studies, Bureau of Economic of Business Research, University of Florida, in Population Studies, Bulletin No. 41, July, 1977, the population of Citrus County is expected to continue to increase substantially in the future, but at a slightly slower rate than it has since 1970. These projections indicate that the county's population will reach 47,400 persons by the year 1980, 71,000 persons by the year 1990, and 82,200 persons by the year 2000.

The 5-mile (8-kilometer) radius area surrounding the proposed facilities currently is sparsely populated with small farms, a few clusters of mobile homes, and some single-family residences along the Withlacoochee River in the extreme northern fringe of the area. Based on a housing unit survey conducted in the area, no people were living within the

Table 37. Population of Florida and of Citrus and Levy Counties and their Municipalities,* April 1, 1970 Census and July 1, 1977 Estimates

	April 1, 1970 (census)	July 1, 1977 (estimate)	Total Change 1970-1977	
			Number	Percent
FLORIDA	6,791,418	8,717,334	1,926,103	28.4
CITRUS	19,196	38,591	19,395	101.0
Crystal River	1,696	2,635	939	55.4
Inverness	2,299	3,190	891	38.8
Unincorporated	15,201	32,766	17,565	115.6
LEVY	12,756	15,930	3,174	24.9
Bronson	698	822	124	17.8
Cedar Key	714	901	187	26.2
Chiefland	1,965	2,036	71	3.6
Inglis	449	729	280	62.4
Otter Creek	230	187	-43	-18.7
Suwannee River (Levy County part)	35	43	8	22.9
Williston	1,939	2,049	110	5.7
Yankeetown	490	539	49	10.0
Unincorporated	6,236	8,624	2,388	38.3

*The five-mile radius area includes portions of these municipalities and unincorporated areas.

Source: Florida Estimates of Population--Municipalities-Counties--State--July 1, 1977, Division of Population Studies, Bureau of Economic and Business Research, University of Florida, February, 1978.

3-mile (4.8-kilometer) radius of the proposed site. Also, assuming an average of 2.5 persons per housing unit, it is estimated that approximately 500 persons presently reside within the 3- to 5-mile (4.8- to 8-kilometer) radii from the proposed stack locations.

ECONOMICS

Employment in the county is primarily concentrated in the service-related industries, wholesale and retail trade, government, miscellaneous services, and construction. Historically, both total employment and construction employment reached a peak during the construction of Florida Power's Crystal River Unit 3. As shown by the jump in the unemployment rate in 1975, the county's economy was significantly affected by the general economic recession in the mid-1970's. Although per capita income in the county has increased since 1970, income levels in the county are well below those in the overall state income levels (State of Florida, 1977).

The principal source of revenue for the county government is ad valorem taxes levied on real and personal property. As of January 1, 1976, the total taxable property value in the county was $381,742,000 which represented an increase in such values of almost 30 percent since 1975. The total taxes levied by the county were $6,944,000.

AESTHETIC AND ENVIRONMENTALLY SENSITIVE AREAS

WETLANDS

Wetlands of the proposed plant location and directly adjacent property include small potholes and two types of hardwoods-forested wetlands: hydric hammock and coastal hydric hammock. Saltwater marsh occurs just west of the proposed plant location but on Florida Power property. These wetlands on and adjacent to the site total 219 hectares (540 acres), or four percent of the wetlands within an 8-kilometer (5-mile) radius of the site. The wetlands on the proposed plant location itself comprise less than one percent of this regional total.

Wetlands are a valuable resource for water conservation, flood control, and waste recycling (Wharton, et al., 1976). In addition, they provide habitat for wildlife when surrounding lands are stressed by such factors as fire, drought, or human disturbance. Most of these systems are relatively stable, and are characterized by high biomass productivity.

Of the wetlands occurring on the Florida Power property, the coastal hydric hammock and saltwater marsh are of greatest value in a regional sense. No salt marsh is present on the proposed plant location. The coastal hydric hammock acts as a buffer system between the estuary and the upland terrestrial systems. During storm events and hurricanes, the hammocks reduce seawater flooding into inland areas. They also reduce sudden influxes of freshwater runoff into the estuary, thereby reducing salinity fluctuations.

The coastal hydric hammock and the hydric hammock systems on the property are closely tied to the hydrologic regime of the Floridan Aquifer, since the upwelling of this fresh water subsidizes these systems and may prevent salinity buildups in the coastal hydrick hammock.

The small pothole marshes on the site are associated with the surficial groundwater aquifer, so that flooding is a seasonal occurrence dependent upon rainfall levels. These marshes are generally small, isolated, and lacking the organic soils, productivity, and stability usually associated with wetlands. Consequently, they are of only localized value, and are less significant than the forested wetlands on a regional level.

RARE AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service publications include the existing listings at the time of the document's preparation (United States List of Endangered Fauna, 1974; Threatened Wildlife of the United States, 1973; Endangered and Threatened Wildlife and Plants, 1977) and the proposed listing (Proposed Endangered Status on Some 1700 U.S. Vascular Plant Taxa, 1976). In addition, each publication of the Federal Register since 1977 was checked in order to verify additional species listed as rare and endangered. State listings included those of the Florida Game and Freshwater Fish Commission (1974) and the Florida Committee on Rare and Endangered Plants and Animals (1976).

FLORIDA MANATEE

The manatee is classified as "endangered" on both state and federal lists. A dialogue has been carried on with personnel of the Gainesville Field Station National Fish and Wildlife Lab concerning manatee populations near the proposed site and the potential impacts of Units 4 and 5 upon the endangered Florida manatee.

Individuals at the Gainesville Fish and Wildlife facility have been collecting data concerning the presence of manatee over a larger area which includes the power plant site. Available information is presently in two forms (Powell, 1978). One source is a study which receives reports of manatee sightings from members of the general public. Anyone who has seen a manatee is asked to report the sighting by notices posted in appropriate areas. Information from these reports is collected by the Gainesville laboratory and is in the process of being computerized. At present, only the data from 1974 through 1976 has been computerized. Data are entered using a coordinate system so that printouts of site-specific information can be obtained (Scott, 1978).

Another source of information is overflights of the discharge area which Fish and Wildlife personnel have undertaken on a biweekly basis as a part of a regular census of manatee population in the Crystal River area. Data from these studies have not been developed (Powell, 1978).

A printout of Citrus County sightings was obtained from the 1974 to 1976 data bank. Table 38 presents a list of sightings reported near the existing power plant facility. The reported years cover a period of time when numerous researchers from the University of Florida were at work in the estuary surrounding the power plant site. It is safe to assume the area was more extensively observed than many other comparable areas during the same period, and that scientifically trained observers were more likely to file reports of the sightings than were members of the general public. In short, the number of sightings of manatee in the vicinity of the facility is believed to be a result of more extensive observation and reporting for this particular study rather than an indication of any concentration of manatee in the area.

The Gainesville Fish and Wildlife laboratory also collects the bodies of dead manatees which are found. No manatee bodies have been collected from the power plant area, nor have any of the bodies found in the Citrus County area shown signs of power plant-related injuries (Scott, 1978).

EASTERN INDIGO SNAKE

This snake is classified as "threatened" by both state and federal lists. The eastern indigo snake occurs locally in peninsular Florida,

Table 38. Manatee Sightings Reported Near the Crystal River Site to U.S. Fish and Wildlife for 1974-1976

Month	Year	Down*	Across	Number	Respondent
March	1975	482	592	1	B. Obry
March	1975	482	592	1	S. Rednour
March	1975	482	592	2	M. Osterling
June	1975	480	599	1	M. Homer
February	1975	479	595	1	M. Homer
March	1975	479	595	2	M. Homer
August	1975	479	596	1	C. Taylor
June	1975	478	595	1	P. Purcell

*The site of the present Crystal River facilities is about 480 down and 590 across in the Fish and Wildlife computer mapping system. For purposes of comparison, it may be useful to note that the coordinates of the Crystal River head springs are 496 down, 571 across.

Source: U.S. Fish and Wildlife Service, 1978.

in a few widely scattered areas of the Georgia Coastal Plain, and in parts of the Florida panhandle. This snake occupies a wide variety of habitat types. The indigo snake is a species of high humidity requirements; however, it can survive in xeric environments if gopher tortoise burrows are present (Kochman, 1976). According to the Cross Florida Barge Canal Restudy Report (Florida Game and Fresh Water Fish Commission, 1976), the occurrence of indigo snake in similar type habitats as found on the Florida Power property is as follows:

Coastal Hammock--Occasional,
Hydric Hammock--Frequent,
Mesic Hammock--Occasional,
Xeric Hammock--Occasional,
Slash Pine Flatwoods--Occasional,
Pine Plantation--Infrequent, and
Evergreen Oak Scrub--Occasional.

During ecological surveys of these types of habitats on the property, the indigo snake was not observed; however, it has been reported to occur on the site. The proposed site is considered good habitat for indigo snakes because of the diversity of habitat, the numerous area of thickets, brush piles, and other organic debris, and the apparently large populations of rodents and other herptiles.

In response to specific questions by the Environmental Protection Agency and the United States Fish and Wildlife Service concerning population studies and site-specific information on the indigo snake, various authorities (Dr. Roy McDirmid and Dr. Howard W. Campbell) were contacted. It was found that no site-specific information was available, nor were there presently proven methods for precisely estimating population densities of this species. Dr. Howard Campbell (1978) recommended searches be conducted in likely habitat to roughly evaluate populations of indigo snake.

COONTIE

The coontie, a plant listed as "threatened" on the state list, occurred in scattered locales in the hardwood hammocks on Florida Power property. The Florida Game and Freshwater Fish Commission reports this species is common to abundant in several habitats throughout the coastal part of the state.

AMERICAN ALLIGATOR

The alligator is classified as "threatened" on the federal list. A few alligators were sighted in the existing fly ash pond, but none were encountered in the other wetlands on Florida Power property.

STATE THREATENED SPECIES

The short-tailed snake is classified "threatened" on the state list. The snake is a burrowing animal, seldom occurring above ground except during the spring and fall. Encroachment by man into preferred habitat is the greatest threat to this species. In some instances, thermal stress caused by removal of overstory in sandhills communities have extirpated certain populations of this snake (Campbell, 1975).

The range of the short-tailed snake is confined entirely to peninsular Florida from Highlands to Columbia counties. This species occurs chiefly in longleaf pine/turkey oak associations and infrequently in upland oaks proximal to the former (Campbell, 1976). Two specimens were reported (Florida Game and Freshwater Fish Commission, 1976) to have been collected in sandpine and evergreen oak scrub. This is the first confirmed record of this species occurring in evergreen oak scrub. Longleaf pine-turkey oak ridges, upland hammock, and sand pine scrub are cited (Campbell, 1976 and Highton, 1956) as preferred habitat for this species; however, such forest associations are not found on the site.

The only confirmed record of this species in Citrus County is several miles to the east of the proposed site and in a more xeric habitat (Campbell, 1976).

Methods for collecting these animals include pit fall traps with diversionary drift fences, hop nets, and nocturnal road driving. Nocturnal road driving was the method employed to census this species. The short-tailed snake was not encountered on the site.

As with other secretive forms, the scarcity of information on the short-tailed snake makes it particularly difficult to assess impacts or to predict the occurrence of this species.

Three other state "threatened" species (gopher tortoise, American osprey, and Florida mouse) are known to occur on the site. Eight active gopher tortoise burrows were found, six in the scrub and two in early successional communities. One osprey nest was located on the southwestern portion of the property. However, the dead tree in which this nest occurred has since collapsed due to decay. The Florida mouse was live-trapped in an evergreen oak scrub community.

RECREATIONAL AND PUBLIC FACILITIES

Although the nearby Crystal River and Yankeetown areas are centers of water-based recreational activities, no recreational or public facilities which would be affected by the presence of the proposed plants have been identified within the project area.

CLASS I AREAS

The Chassahowitzka National Wilderness Area, located 21 kilometers (13 miles) south of the proposed plant site, is the only Class I area with respect to PSD air quality requirements which is within the zone of influence of the proposed plants. This area, which is a coastal wildlife refuge and natural area, was designated as a Class I area by the 1977 Clean Air Act Amendments. A preliminary analysis indicated that operation of Crystal River Units 4 and 5 would meet the allowable increments for this area only if baseline air concentrations at

Chassahowitzka are reduced (e.g., by substituting low sulfur fuel for high sulfur fuel at the existing plants).

HISTORICAL AND ARCHAEOLOGICAL LANDMARKS

The stretch of land between the north bank of the Crystal River and the south bank of the Withlacoochee River has a well-authenticated history. Shell mounds and artifacts found along both rivers and along the Gulf of Mexico coastline attest that the area was inhabited by the Timucuan Indians, possibly as early as 2000 BC.

In the early 1830's, white settlers began to displace the Seminole Indians, who had occupied the region for only a few years. The Seminoles were Creeks who broke away from the main tribe and moved south to avoid forced relocation by the U.S. Government. Before the Seminoles, the area was occupied by the Timucuans, who were encountered by Spanish explorers in 1528. The economy of the area was largely based on the timber and pencil industries (utilizing the prize stands of red cedar found in the coastal hammocks) between 1855 and 1890, and on the local phosphate industry from 1890 to to World War I.

Although no cultural or historical landmarks exist on the proposed plant location, there are twenty known archaeological sites on the Florida Power Corporation Crystal River property, all of which are recorded in the archaeological site files of the Florida Division of Archives. Eighteen of the sites were recorded as the result of an archaeological and historical inventory of the Crystal River plant property conducted by the Division of Archives, History, and Records Management, Bureau of Historic Sites and Properties for Florida Power in May, 1972. The remaining two sites had been previously recorded. All sites on the plant property are shell middens ranging from possibly as early as 2000 B.C. to approximately 1000 A.D. and occur along the coastline and river banks of the northwestern and southwestern portions of the property (see Figure 17).

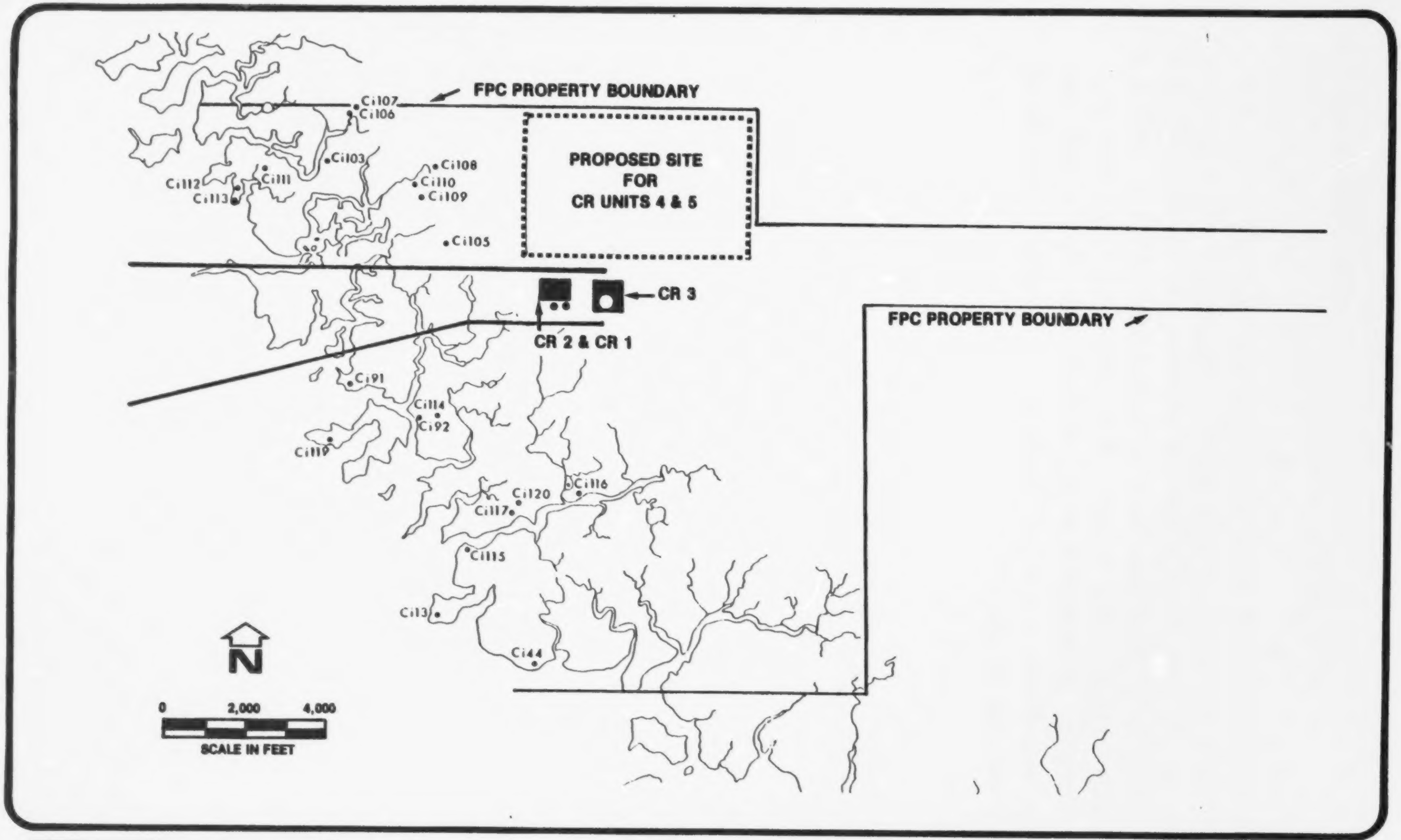
FPC PROPERTY BOUNDARY
PROPOSED SITE FOR CR UNITS 4 & 5
CR 3
CR 2 & CR 1
FPC PROPERTY BOUNDARY
Ci107
Ci106
Ci103
Ci108
Ci110
Ci109
Ci112
Ci111
Ci113
Ci105
Ci91
Ci114
Ci92
Ci119
Ci116
Ci120
Ci117
Ci115
Ci13
Ci44
N
0
2,000
4,000
SCALE IN FEET

Figure 17
ARCHAEOLOGICAL SITE INVENTORY

SOURCE: DIVISION OF ARCHIVES, HISTORY, AND RECORDS MANAGEMENT, 1972

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

Of the 20 archaeological sites on the Florida Power property (see Figure 17), only four are relatively close to the location of the proposed facilities. Of these four archaeological sites, one site (8Ci105), is badly deteriorated to a state where it is no longer likely to yield any meaningful data (Hutto and Steinen, 1972), and no cultural artifacts were retrieved. Sites 8Ci108 and 109 are both very small, undisturbed middens, but yielded no cultural artifacts in the survey. Site 8Ci110 yielded only one artifact.

CHAPTER IV

DESCRIPTION OF THE PROPOSED PROJECT

GENERAL DESCRIPTION

The proposed Crystal River Units 4 and 5 are to be 695 Mw (gross) coal-fired units lying to the north of existing Crystal River Units 1, 2, and 3. Cooling will be accomplished with saltwater towers (one tower per unit) using make-up water from the existing discharge canal. Figure 18 shows the location of the proposed units in comparison to the existing units. Figure 19 shows the details of the arrangement of Units 4 and 5 and associated facilities.

The total cleared area for Units 1, 2, and 3 is about 129 hectares (319 acres). About 135 hectares (333 acres) will be cleared for the construction of Units 4 and 5. As indicated in Figure 19, the cooling towers will be located west of the units. Existing coal handling will be expanded, and a storage area east of the proposed units will be constructed. Solid waste products (ash) will be stored in an area located east and southeast of the proposed units.

Plant complex buildings will be architecturally similar to Units 1 and 2. The steam generator will be partially enclosed within a building while the turbine will be completely enclosed. When Units 4 and 5 are completed, there will be 4 stacks on the site. The stacks of Units 1 and 2 are about 152 meters (500 feet) high, while those proposed for Units 4 and 5 will be about 183 meters (600 feet) in height. The cooling towers will be about 134 meters (440 feet) tall and 113 meters (370 feet) in diameter. Other facilities will be generally less than 30 meters (100 feet) high.

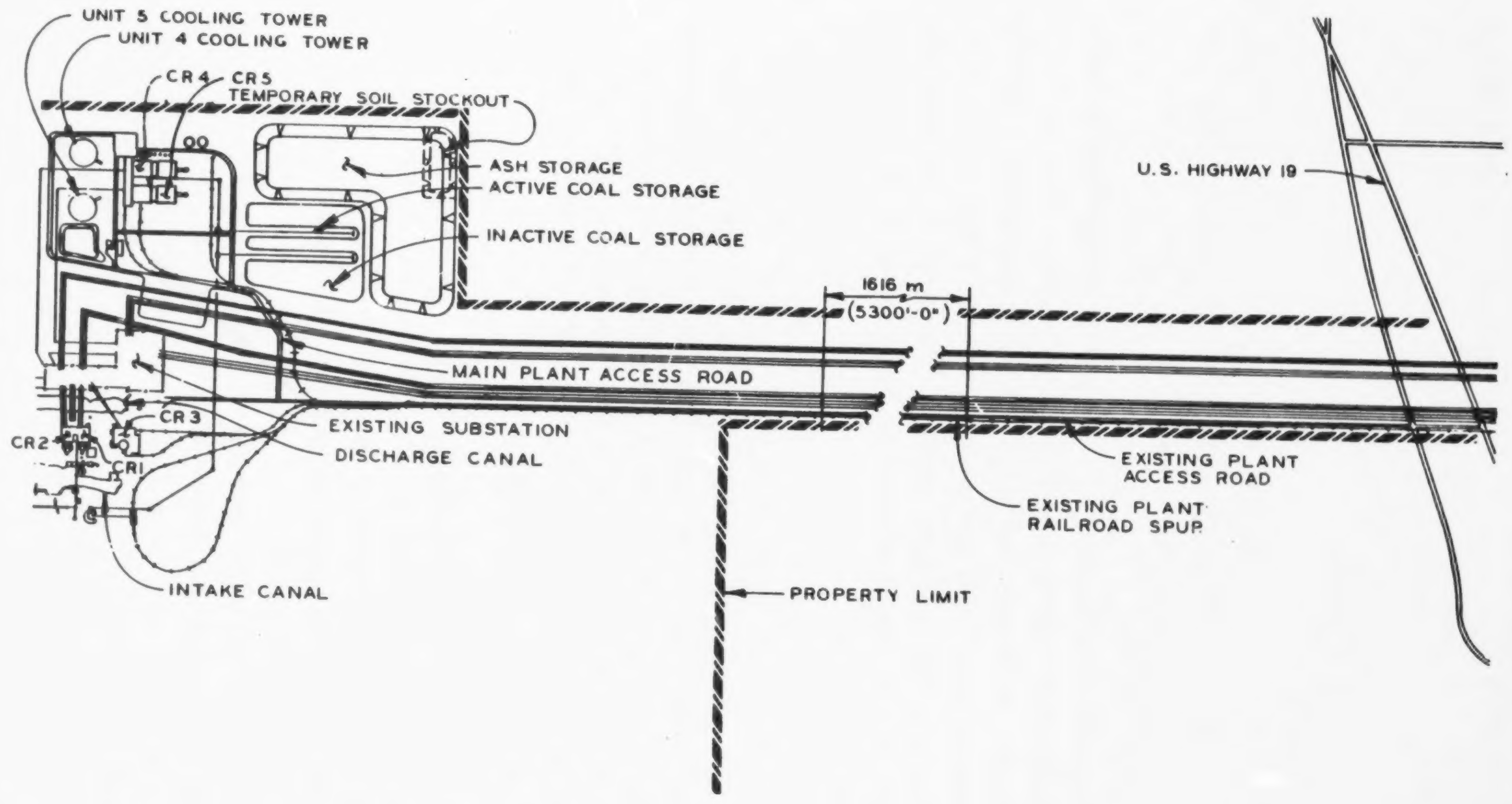
UNIT 5 COOLING TOWER
UNIT 4 COOLING TOWER
CR4
CR5
TEMPORARY SOIL STOCKOUT
ASH STORAGE
ACTIVE COAL STORAGE
INACTIVE COAL STORAGE
U.S. HIGHWAY 19
1616 m
(5300'-0")
MAIN PLANT ACCESS ROAD
CR3
CR2
CR1
EXISTING SUBSTATION
DISCHARGE CANAL
EXISTING PLANT ACCESS ROAD
EXISTING PLANT RAILROAD SPUR
INTAKE CANAL
PROPERTY LIMIT
N
0
2000'
4000'
1" = 2000'

Figure 18

CRYSTAL RIVER SITE LAYOUT

SOURCE: BLACK AND VEATCH, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

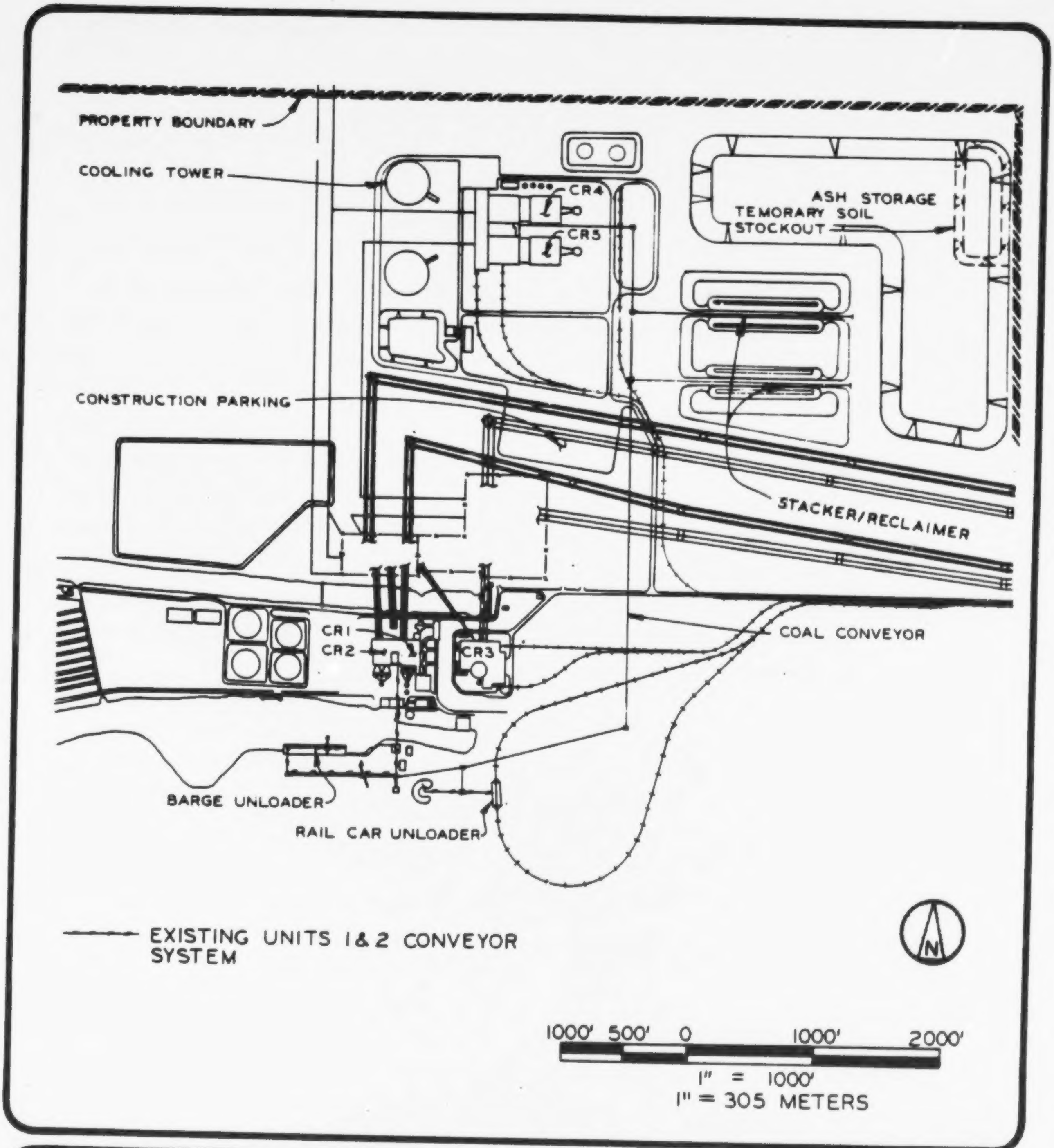
PROPERTY BOUNDARY
COOLING TOWER
CR4
CR5
ASH STORAGE
TEMORARY SOIL
STOCKOUT
CONSTRUCTION PARKING
STACKER/RECLAIMER
CR1
CR2
CR3
COAL CONVEYOR
BARGE UNLOADER
RAIL CAR UNLOADER
EXISTING UNITS 1& 2 CONVEYOR SYSTEM
N
1000' 500' 0 1000' 2000'
1" = 1000'
1" = 305 METERS

Figure 19

CRYSTAL RIVER FACILITY LAYOUT

SOURCE: BLACK AND VEATCH, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

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CONSTRUCTION

The construction contractor will be responsible for conforming to all federal and state regulations concerning stormwater and wastewater discharge during construction. The perimeter runoff collection ditch system will be constructed as soon as site work is initiated. A temporary drainage system will be provided and maintained in the vicinity of the generating complex and laydown area. This system will be designed to hold construction runoff until permanent drainage facilities are completed and operational. The mitigative measures section of this report presents measures which will be taken to mitigate impacts during construction. Detailed erosion and sedimentation control plans for the construction phase are presented in Chapter 4 of the Technical Support Documents.

RAW MATERIALS HANDLING, STORAGE, AND TRANSPORTATION

Coal supplies for Crystal River Units 4 and 5 have not been committed. It is presently planned to utilize a blend of coal which will meet EPA sulfur emission standards without the use of flue gas scrubbers. The proposed design coal for Units 4 and 5 is a 50/50 blend of typical Appalachian and western coals. A portion of the coal, one million tons per year at 12,500 Btu/lb and less than 0.75 percent sulfur, has been contracted. At the rated gross output (695 Mw) and the design blend heating value of about 23,923 KJ per kilogram (10,285 Btu per pound), the coal consumption will be approximately 294,000 kilograms (648,000 pounds) per hour per unit. Average coal consumption per year over the 30-year life of Units 4 and 5 will be approximately 1,700,000 metric tons (1,870,000 tons) per year for each unit based on a 0.66 annual average capacity factor.

Fuel oil will be used as auxiliary fuel for furnace warm-up and coal ignition during start-up. Diesel fuel and gasoline will be used to power the emergency fire pumps and mobile coal and ash handling equipment. Average fuel oil consumption will be approximately 10,600 cubic meters (2,800,000 gallons) per year per unit, based upon 200 starts per year.

About 50 percent of the coal will be delivered to the Crystal River site by train from Appalachia. This coal will be transported in 70- to 110-car unit trains with 100-ton capacity cars. Four to six trains per week will be required. Western coals will be transported by unit rail trains to the Mississippi River, by river barge to New Orleans, and by ocean-going barge to the Crystal River site. Barge unloading facilities in existence at Crystal River will be used. The system is designed to unload barges of up to a 13,600-metric ton (15,000-ton) capacity. An average of three barges per week will be needed. Auxiliary fuels will be delivered by truck or rail, depending on the supplier.

Figure 19 shows the existing and proposed coal handling systems for the Crystal River plant complex. Figure 20 schematically illustrates how the proposed facilities will be added to existing facilities.

Units 4 and 5 will require in-plant, active, and inactive coal storage. In-plant storage will be provided in six or seven silos for each unit. Active storage provides a fuel buffer between the intermittent arrival of coal trains and barges and the slower steady consumption of the plant. Inactive storage is used during periods when the supply of coal is interrupted. Both active and inactive storage will be provided in the area adjacent to the ash storage area.

The proposed storage areas provide approximately 39,000 metric tons (43,000 tons) of active storage and 776,300 metric tons (885,000 tons) of inactive storage in an area of about 111,000 square meters (27.5 acres). An additional storage of 80,000 square meters (20 acres) will be located adjacent to the stacker-reclaimer system.

Active storage will provide about an eight-day supply of fuel for both units generating at 90 percent capacity. Fuel oil storage will be in two steel cylindrical plate storage tanks located within two clay-lined areas north of Unit 4.

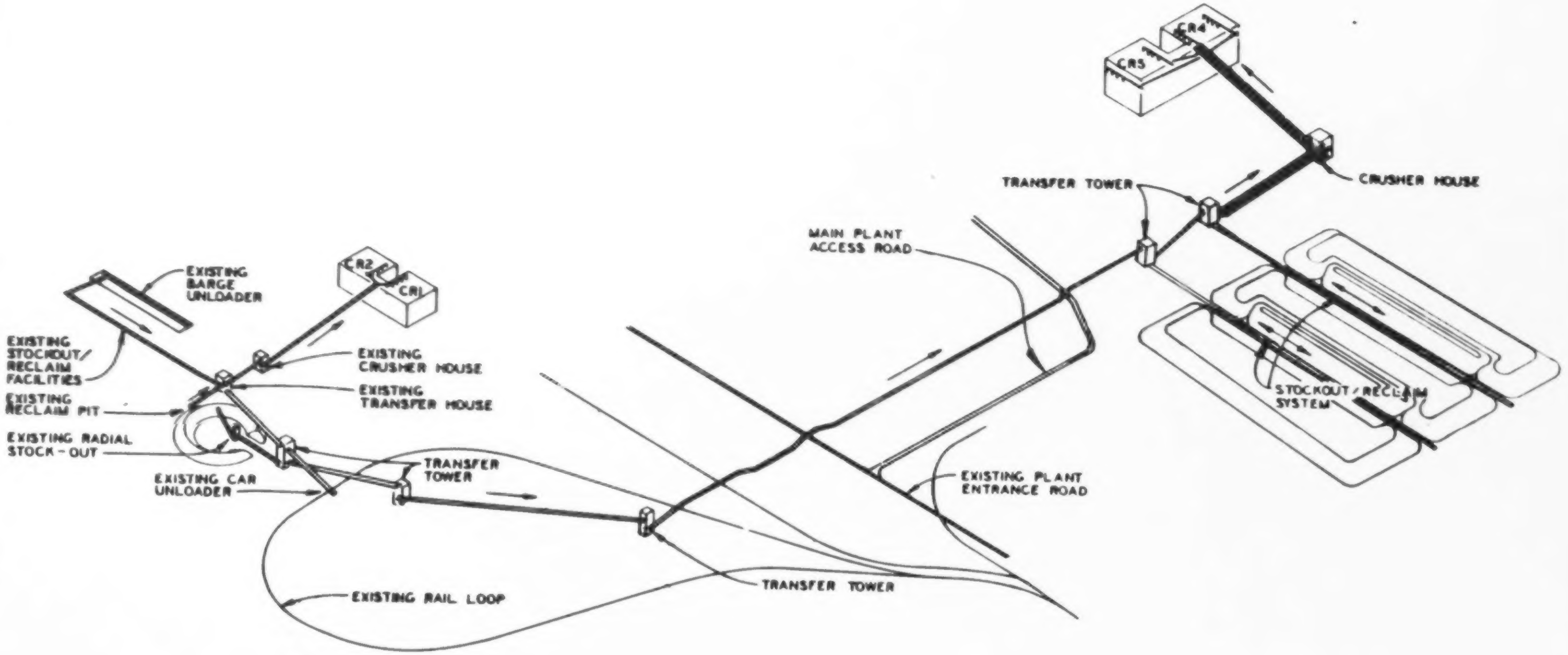

CR4
CR5
CRUSHER HOUSE
TRANSFER TOWER
MAIN PLANT ACCESS ROAD
STOCKOUT/RECLAIM SYSTEM
EXISTING BARGE UNLOADER
CR2
CR1
EXISTING STOCKOUT/ RECLAIM FACILITIES
EXISTING CRUSHER HOUSE
EXISTING TRANSFER HOUSE
EXISTING RECLAIM PIT
EXISTING RADIAL STOCK-OUT
EXISTING CAR UNLOADER
TRANSFER TOWER
EXISTING PLANT ENTRANCE ROAD
TRANSFER TOWER
EXISTING RAIL LOOP

Figure 20
COAL HANDLING FACILITIES ISOMETRIC

SOURCE: BLACK AND VEATCH, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

CHAPTER V

PROPOSED PROCESS AND COOLING WATER SYSTEMS: SOURCES, DISCHARGES, EFFLUENT CHARACTERISTICS

INTRODUCTION

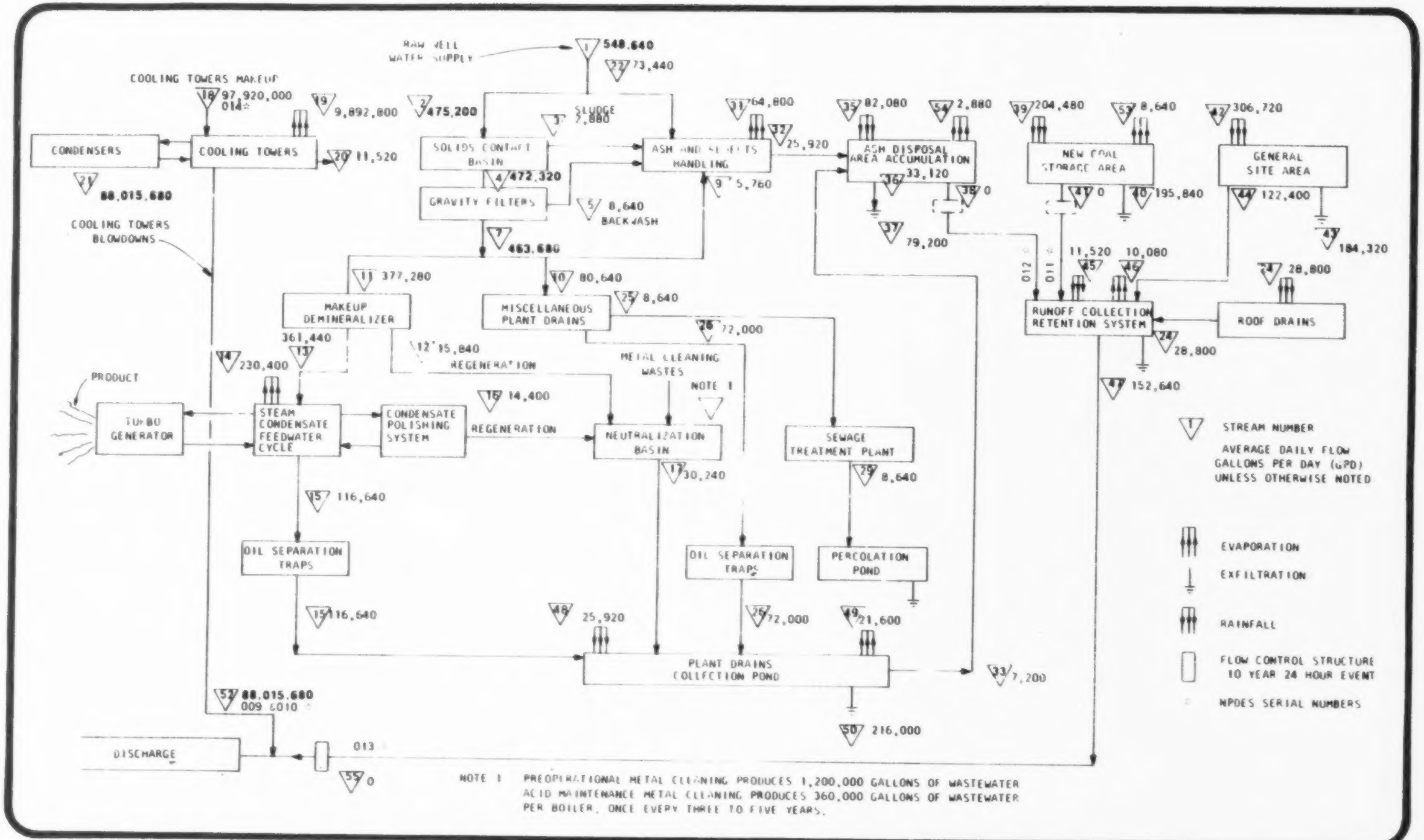
Figure 21 is a schematic flow diagram of plant water supplies, treatment, process consumption, recycle, and discharge. Table 39 presents the annual average daily quantity of water used and discharged for normal and peak operating conditions and for temporary shutdown plant conditions.

WATER SOURCES

The peak water use occurs when both generating units are generating at 100 percent load factor and maximum atmospheric evaporative conditions exist [32.8°C (91°F) dry bulb temperature and 55 percent relative humidity]. Normal water use occurs when both units are generating at 66 percent load factor under average evaporative conditions [21.7°C (71°F) dry bulb temperature and 77 percent relative humidity].

Rainfall and evaporation data from site areas have been generated using the average annual figures of approximately 1,400 millimeters per year (55 inches per year) for rainfall and 1,220 millimeters per year (48 inches per year) for evaporation (Climatic Atlas of the U.S., 1968).

Water required to operate Crystal River Units 4 and 5 will be drawn from ground water and sea water. Raw ground water for plant freshwater uses will be obtained from a well field along the Florida Power Central Florida transmission line right-of-way to the east of the plant complex. Originally, a linear well field of 21 wells spaced 500 feet apart was planned, each with a capacity of 100 gpm for a maximum capacity of 3 mgd flow. Seven wells are now planned, based on the results of test drilling. Test drilling to date has shown the initial five wells to have much higher transmissivities than used in the original tentative


RAW WELL WATER SUPPLY
1 548,640
22 73,440
COOLING TOWERS MAKEUP
18 97,920,000
014
19 9,892,800
CONDENSERS
COOLING TOWERS
20 11,520
21 88,015,680
COOLING TOWERS BLOWDOWNS
2 475,200
SLUDGE
3 7,880
SOLIDS CONTACT BASIN
4 472,320
GRAVITY FILTERS
5 8,640 BACKWASH
7 463,680
ASH AND REJECTS HANDLING
31 64,800
32 25,920
9 5,760
35 82,080
54 2,880
ASH DISPOSAL AREA ACCUMULATION
36 33,120
38 0
37 79,200
39 204,480
53 8,640
NEW COAL STORAGE AREA
41 0
40 195,840
42 306,720
GENERAL SITE AREA
44 122,400
43 184,320
012
011
11,520
45
10,080
46
34 28,800
ROOF DRAINS
RUNOFF COLLECTION RETENTION SYSTEM
24 28,800
47 152,640
11 377,280
MAKEUP DEMINERALIZER
10 80,640
MISCELLANEOUS PLANT DRAINS
25 8,640
26 72,000
361,440
13
12 15,840
REGENERATION
14 230,400
PRODUCT
TURBO GENERATOR
STEAM CONDENSATE FEEDWATER CYCLE
CONDENSATE POLISHING SYSTEM
16 14,400
REGENERATION
METAL CLEANING WASTES
NOTE 1
NEUTRALIZATION BASIN
17 30,240
SEWAGE TREATMENT PLANT
29 8,640
15 116,640
OIL SEPARATION TRAPS
OIL SEPARATION TRAPS
PERCOLATION POND
15 116,640
48 25,920
26 72,000
49 21,600
PLANT DRAINS COLLECTION POND
33 7,200
50 216,000
52 88,015,680
009 &010
DISCHARGE
013
55 0
STREAM NUMBER
AVERAGE DAILY FLOW GALLONS PER DAY (GPD) UNLESS OTHERWISE NOTED
EVAPORATION
EXFILTRATION
RAINFALL
FLOW CONTROL STRUCTURE 10 YEAR 24 HOUR EVENT
NPDES SERIAL NUMBERS

NOTE 1 PREOPERATIONAL METAL CLEANING PRODUCES 1,200,000 GALLONS OF WASTEWATER ACID MAINTENANCE METAL CLEANING PRODUCES 360,000 GALLONS OF WASTEWATER PER BOILER, ONCE EVERY THREE TO FIVE YEARS.

Figure 21

PLANT WATER USE DIAGRAM

SOURCE: Black and Veatch, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

Table 39. Crystal River Units 4 and 5 Site and Plant Water Use

Stream Number	Description	Peak		Normal		Temporary Shutdown	
		dm^3/s	(gpm)	dm^3/s	(gpm)	dm^3/s	(gpm)
1	Raw Well Water Supply	34.2	(543)	24.0	(381)	4.8	(77)
2	Water Pretreatment System Makeup	29.3	(465)	20.8	(330)	4.8	(77)
3	Solids Contact Basin Sludge	0.2	(3)	0.1	(2)	0	(0)
4	Solids Contact Basin Effluent	29.1	(462)	20.7	(328)	4.8	(77)
5	Filter Backwash Wastewater	0.4	(6)	0.4	(6)	0	(0)
7	Gravity Filter Effluent	28.7	(456)	20.3	(322)	4.8	(77)
9	Ash Handling System Service Water Uses	0.3	(4)	0.3	(4)	0	(0)
10	Miscellaneous Station and Potable Water Uses	3.5	(56)	3.5	(56)	3.5	(56)
11	Demineralizer Makeup	24.9	(396)	16.5	(262)	1.3	(21)
12	Demineralizer Regeneration Wastes	1.0	(16)	0.7	(11)	0.7	(11)
13	Condensate-Feedwater-Steam Cycle Makeup	23.9	(380)	15.8	(251)	0.6	(10)
14	Steam Cycle Evaporative Losses	15.4	(245)	10.1	(160)	0	(0)
15	Steam Cycle Liquid Losses	7.8	(123)	5.1	(81)	0	(0)
16	Condensate Polisher Wastes	0.7	(12)	0.6	(10)	0.6	(10)
17	Neutralization Basin Effluent	1.7	(28)	1.3	(21)	1.3	(21)
18	Cooling Towers Makeup (saltwater)*	4,289	(68,000)	4,289	(68,000)	0	(0)
19	Cooling Towers Evaporation	711.5	(11,280)	433.4	(6,870)	0	(0)
20	Cooling Towers Drift	0.8	(13)	0.5	(8)	0	(0)
21	Cooling Towers Blowdown	3,577†	(56,707)†	3,855†	(61,122)†	0	(0)
22	Raw Well Water to Ash Handling Systems	4.9	(78)	3.2	(51)	0	(0)

Table 39. Crystal River Units 4 and 5 Site and Plant Water Use, (Continued, Page 2 of 3)

Stream Number	Description	Peak		Normal		Temporary Shutdown	
		dm^3/s	(gpm)	dm^3/s	(gpm)	dm^3/s	(gpm)
24	Rainfall to Roof Drains	1.3	(20)	1.3	(20)	1.3	(20)
25	Sanitary Wastes	0.4	(6)	0.4	(6)	0.4	(6)
26	Miscellaneous Plant Drains	3.2	(50)	3.2	(50)	3.2	(50)
29	Sewage Treatment Plant Effluent	0.4	(6)	0.4	(6)	0.4	(6)
31	Bottom Ash Hopper Evaporation	4.2	(67)	2.9	(45)	0	(0)
32	Water Entrained in Ash from Ash Handling	1.6	(24)	1.1	(18)	0	(0)
33	Water for Ash Dust Suppression and Compaction	0.4	(7)	0.3	(5)	0	(0)
35	Active Ash Storage Area Rainfall	3.6	(57)	3.6	(57)	3.6	(57)
36	Active Ash Storage Area Water Accumulation	2.0	(31)	1.4	(23)	0	(0)
37	Active Ash Storage Area Exfiltration	3.5	(55)	3.5	(55)	3.5	(55)
38	Active Ash Storage Area Runoff to Collection Ditch System (NPDES 012)	0	(0)	0	(0)	0	(0)
39	New Coal Storage Area Rainfall	9.0	(142)	9.0	(142)	9.0	(142)
40	New Coal Storage Area Exfiltration	8.6	(136)	8.6	(136)	8.6	(136)
41	New Coal Storage Area Runoff to Runoff Collection and Retention System (RCRS) (NPDES 011)	0	(0)	0	(0)	0	(0)
42	General Site Area Rainfall	13.4	(213)	13.4	(213)	13.4	(213)
43	General Site Area Exfiltration	8.1	(128)	8.1	(128)	8.1	(128)
44	General Site Area Runoff to Runoff Collection and Retention System	5.3	(85)	5.3	(85)	5.3	(85)
45	Direct Rainfall on Runoff Collection and Retention System	0.5	(8)	0.5	(8)	0.5	(8)

Table 39. Crystal River Units 4 and 5 Site and Plant Water Use, (Continued, Page 3 of 3)

Stream Number	Description	Peak		Normal		Temporary Shutdown	
		dm^3/s	(gpm)	dm^3/s	(gpm)	dm^3/s	(gpm)
46	Runoff Collection and Retention System Evaporation	0.4	(7)	0.4	(7)	0.4	(7)
47	Runoff Collection and Retention System Exfiltration	6.7	(106)	6.7	(106)	6.7	(106)
48	Plant Drains Collection Pond Rainfall	1.1	(18)	1.1	(18)	1.1	(18)
49	Plant Drains Collection Pond Evaporation	1.0	(15)	1.0	(15)	1.0	(15)
50	Plant Drains Collection Pond Exfiltration	12.0	(197)	9.2	(150)	4.5	(74)
51	Plant Drains Collection Pond Overflow	0	(0)	0	(0)	0	(0)
52	Plant Discharge 009 and 010	3,577†	(56,707)†	3,855†	(61,122)†	0	(0)
53	New Coal Storage Area Evaporation	0.4	(6)	0.4	(6)	0.4	(6)
54	Active Ash Storage Area Evaporation	0.1	(2)	0.1	(2)	0.1	(2)
55	Runoff Collection and Retention System Discharge 013	0	(0)	0	(0)	0	(0)

*Based on 1.1 to 1.2 cycles of concentration.

†"Peak" flows are less than "normal" flows because "peak" and "normal" refer to plant operating conditions, not flow conditions. Utilization of the constant rate makeup system results in makeup flow being constant regardless of unit load or ambient conditions. When a generating unit is at 100 percent load, more circulating water is evaporated than at 66 percent load when ambient conditions remain the same. Since the makeup flow is constant, cooling tower blowdown flow is thus greater at 66 percent load factor (normal) than at 100 percent factor (peak).

Note: During heavy rainfall events (quantities of water greater than the design criteria of 10-year, 24-hour retention), overflow from the runoff retention and collection systems will discharge to the existing discharge canal for Crystal River Units 1, 2, and 3.

Sources: Black and Veatch, 1980.
Environmental Science and Engineering, Inc., 1978.

designs. Results from these tests indicate that four of the seven planned wells are adequate to supply the plant service water. Figure 22 identifies the locations of the supply wells. Specific capacity data from the seven production wells were presented to Florida Power Corporation on October 15, 1979 in a report by Geraghty and Miller, Inc. titled "Hydrogeologic Report on Florida Power Corporation's Proposed Wellfield to Supply Water to Units 4 and 5 at Crystal River, Florida." The original plan for 21 wells was based on a conservative estimate of the transmissivity of the planned wells. Water levels in the well field will be monitored under FDER Conditions of Certification. The well field will meet the rules and regulations of the Southwest Florida Water Management District. Well water will provide make-up to the ash handling system and plant service water. Salt water will be obtained from the existing discharge canal.

WATER TREATMENT

Ground water which has been lime softened and chlorinated will be used as plant service water. Plant service water which has been further demineralized will be used as makeup to the condensate-feedwater-steam cycle. Demineralization will consist of ion exchange by 3 cation-anion exchanger pairs with degasification after the primary anion exchanger. A condensate polishing system is planned for removal of suspended and dissolved solids from the condensate. This system will consist of three mixed-bed (cation and anion) exchangers per generating unit.

STATION CONSUMPTIVE USES

Consumptive use of fresh and salt water results from evaporation, blowdown, and drift from the plant processes, from storage losses in wastes, from steam-cycle losses, and from evaporation and exfiltration of stormwater runoff from impervious surfaces and storage areas. All projected water losses are summarized in Table 39.

Consumptive water uses for the ash and rejects handling systems include evaporative losses from the bottom ash hopper, water accumulated in the

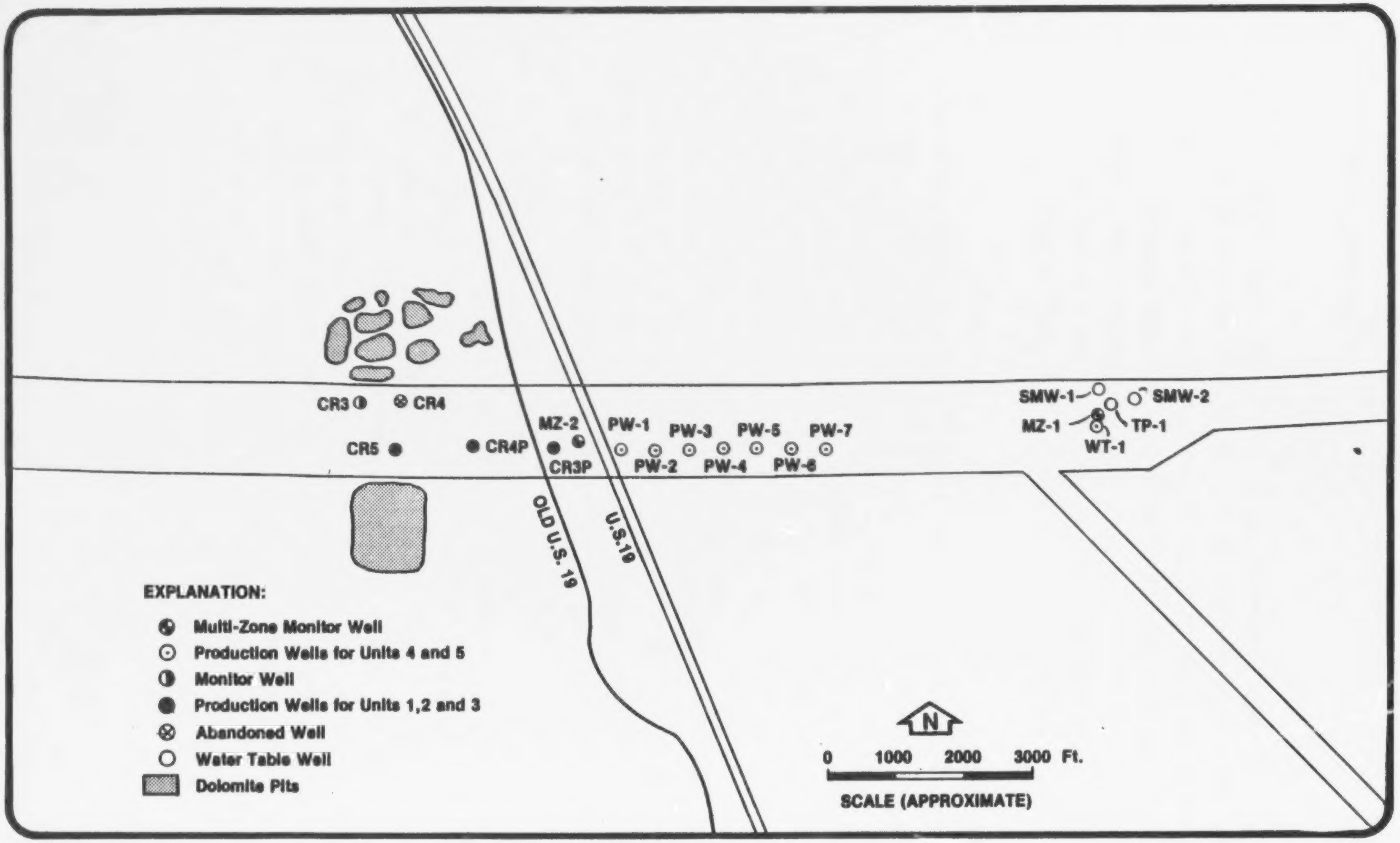

CR3
CR4
CR5
CR4P
MZ-2
CR3P
PW-1
PW-2
PW-3
PW-4
PW-5
PW-6
PW-7
SMW-1
SMW-2
MZ-1
TP-1
WT-1
OLD U.S. 19
U.S.19
N
0
1000
2000
3000 Ft.
SCALE (APPROXIMATE)
EXPLANATION:
Multi-Zone Monitor Well
Production Wells for Units 4 and 5
Monitor Well
Production Wells for Units 1,2 and 3
Abandoned Well
Water Table Well
Dolomite Pits

Figure 22

MAP SHOWING LOCATIONS OF EXISTING WELLS FOR CRYSTAL RIVER UNITS 1, 2 & 3, AND RECENTLY INSTALLED WELLS FOR UNITS 4 & 5

SOURCE: Geraghty and Miller, 1979

FLORIDA POWER CORPORATION

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CRYSTAL RIVER UNITS 4 & 5

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solid ash and rejects material in the ash landfill, and evaporative and seepage losses from this ash landfill area. Fly ash will be handled dry. Bottom ash, precipitation ash, mill rejects (pyrites), and the calcium carbonate sludge contained in the water pretreatment wastewater will be dewatered prior to storage in an above-grade landfill area. Plant wastewater from the plant drains collection pond will be utilized for dust suppression and compaction in the ash landfill area.

COOLING SYSTEM

Each generating unit will have a main turbine and an auxiliary equipment cooling system with a common water system utilizing a natural draft cooling tower for heat dissipation. The main steam cycle for each unit will reject 3.5×10^{12} joules ($3,300 \times 10^6$ Btu) per hour, and the auxiliary equipment will reject approximately 0.2×10^{12} joules (200×10^6 Btu) per hour at full load operating conditions. Total heat load for both units at full load operating conditions will be 7.4×10^{12} joules ($7,000 \times 10^6$ Btu) per hour. Each cooling tower will be approximately 113 meters (370 feet) in diameter at the base and 134 meters (440 feet) in height. The saltwater intake structure serving both units will be located on the north bank of the existing cooling water discharge canal as shown in Figure 23.

Views of the structure are presented in Figures 24 and 25. The structure will be designed to supply a flow of 4,289 dm^3/s (68,000 gpm). It will be about 15.2 meters (50 feet) wide and will be divided into 3 cells. Each inlet cell will be equipped with a half-capacity 2,145 dm^3/s (34,000 gpm) pump, a 4-meter (13-foot) traveling screen, and a high-pressure screen wash pump. Entrance water velocity at low water level and maximum flow will not exceed 0.15 meters (0.5 feet) per second.

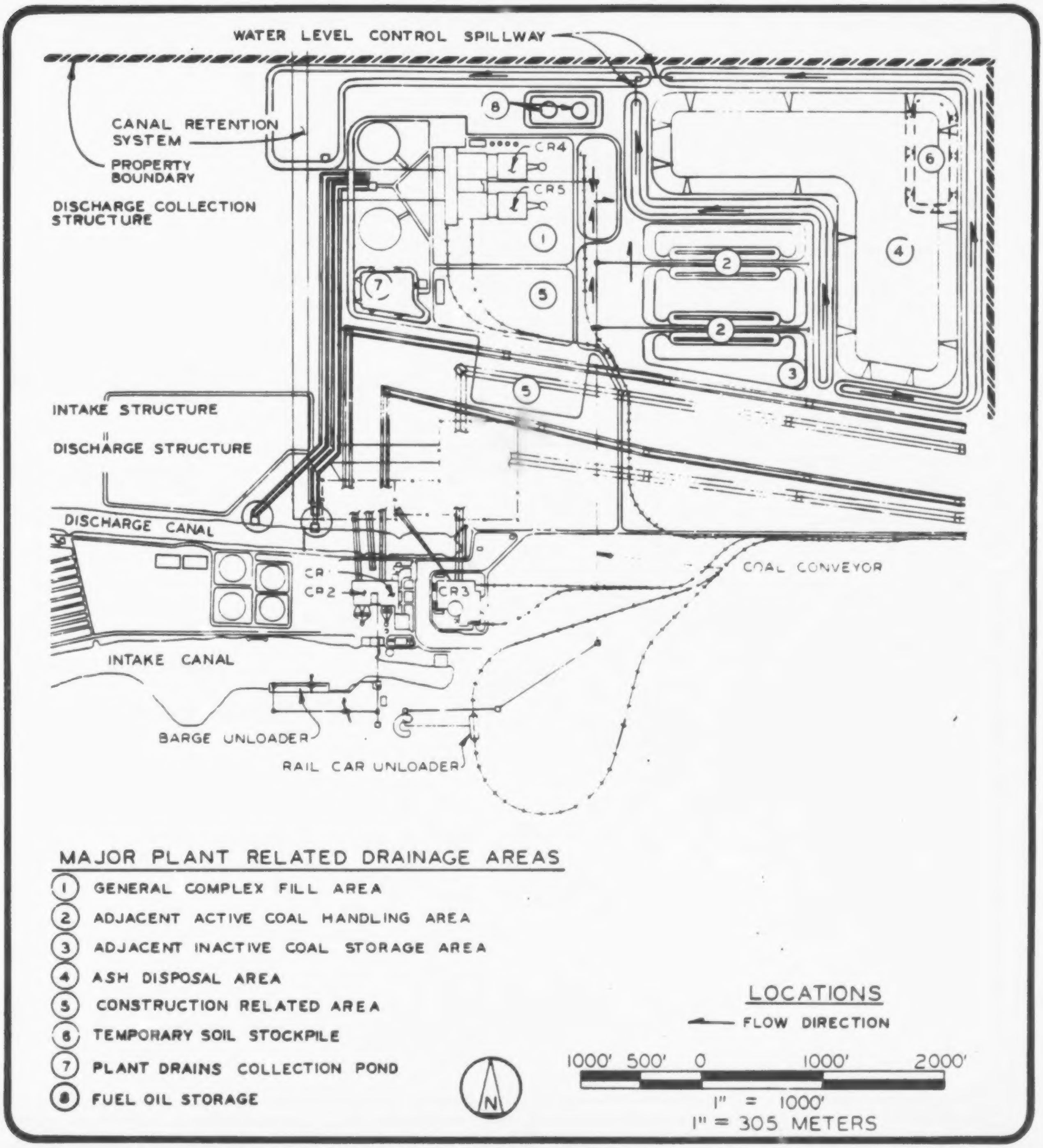
WATER LEVEL CONTROL SPILLWAY
CANAL RETENTION SYSTEM
PROPERTY BOUNDARY
DISCHARGE COLLECTION STRUCTURE
CR4
CR5
INTAKE STRUCTURE
DISCHARGE STRUCTURE
DISCHARGE CANAL
CR1
CR2
CR3
COAL CONVEYOR
INTAKE CANAL
BARGE UNLOADER
RAIL CAR UNLOADER
MAJOR PLANT RELATED DRAINAGE AREAS
① GENERAL COMPLEX FILL AREA
② ADJACENT ACTIVE COAL HANDLING AREA
③ ADJACENT INACTIVE COAL STORAGE AREA
④ ASH DISPOSAL AREA
⑤ CONSTRUCTION RELATED AREA
⑥ TEMPORARY SOIL STOCKPILE
⑦ PLANT DRAINS COLLECTION POND
⑧ FUEL OIL STORAGE
N
LOCATIONS
FLOW DIRECTION
1000' 500' 0 1000' 2000'
1" = 1000'
1" = 305 METERS

Figure 23

UNITS 4 AND 5 SYSTEM LAYOUT

SOURCE: Black and Veatch, 1980

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CRYSTAL RIVER UNITS 4 & 5

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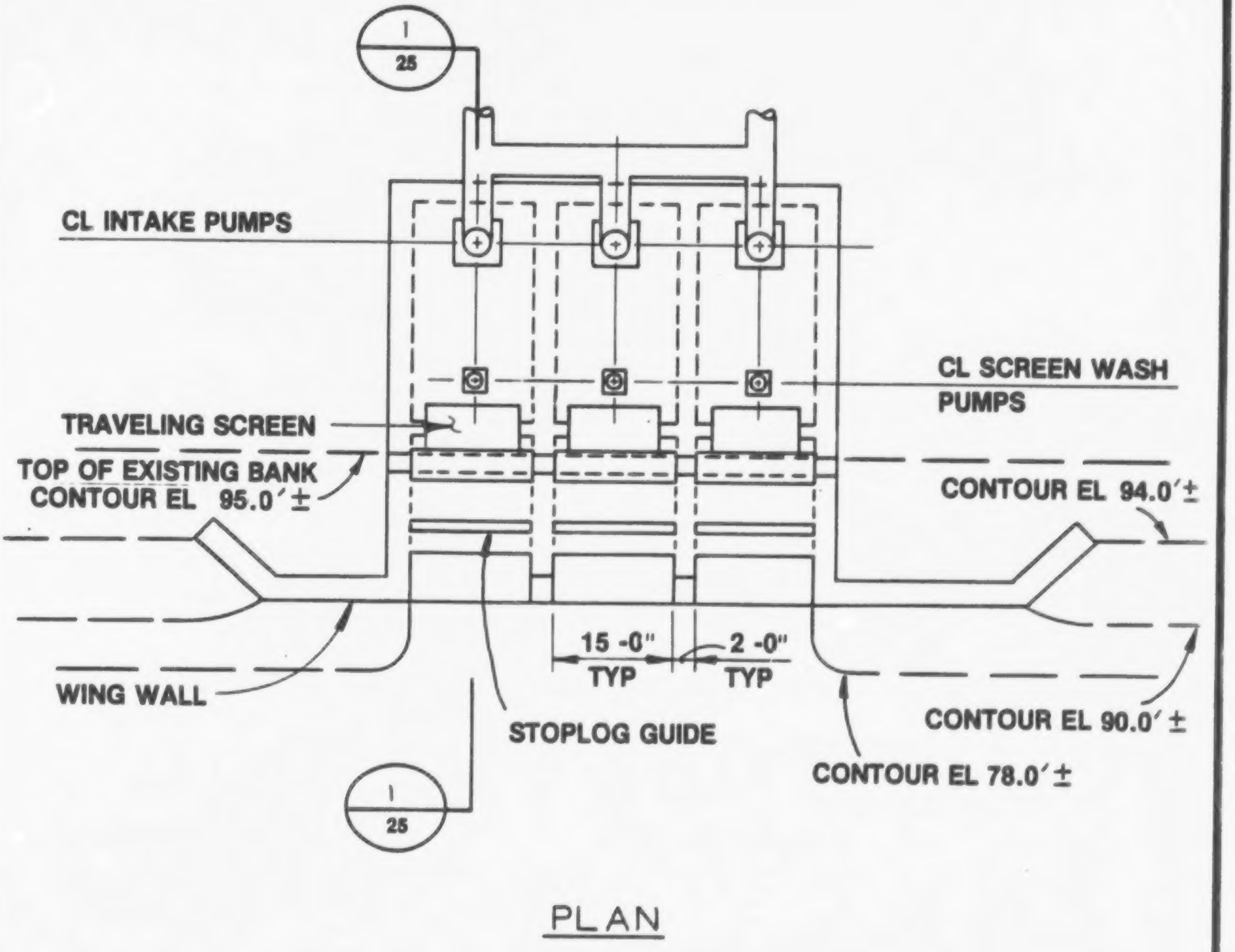
1
25
CL INTAKE PUMPS
CL SCREEN WASH
PUMPS
TRAVELING SCREEN
TOP OF EXISTING BANK
CONTOUR EL 95.0′ ±
CONTOUR EL 94.0′ ±
WING WALL
15 -0"
TYP
2 -0"
TYP
STOPLOG GUIDE
CONTOUR EL 90.0′ ±
CONTOUR EL 78.0′ ±
1
25
PLAN

Figure 24

COOLING TOWER MAKE-UP INTAKE STRUCTURE

SOURCE: BLACK AND VEATCH, 1980

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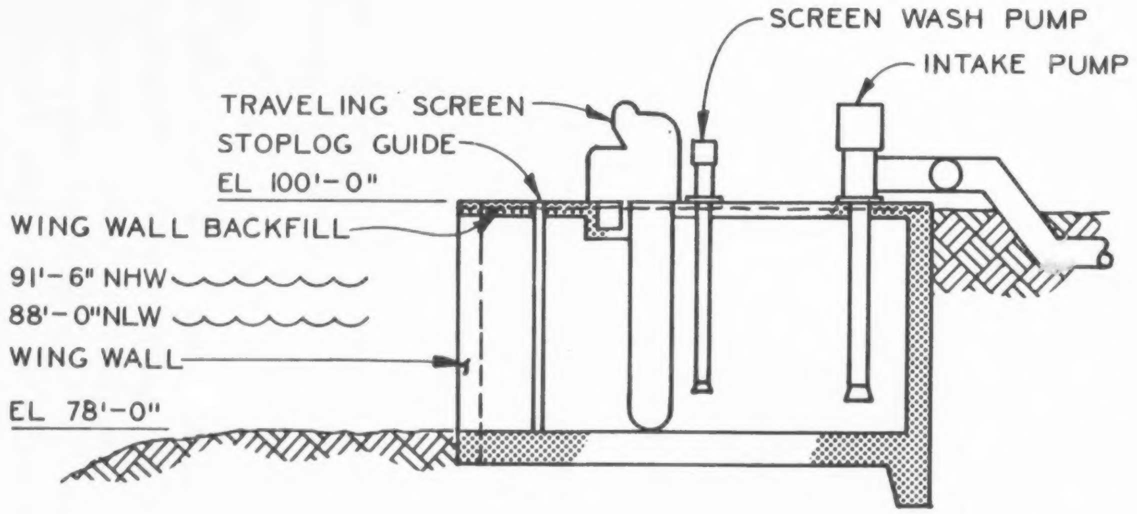
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA


SCREEN WASH PUMP
INTAKE PUMP
TRAVELING SCREEN
STOPLOG GUIDE
EL 100'-0"
WING WALL BACKFILL
91'-6" NHW
88'-0"NLW
WING WALL
EL 78'-0"

SECTION I

Figure 25

COOLING TOWER MAKE-UP INTAKE STRUCTURE

SOURCE: BLACK AND VEATCH, 1980

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Cooling tower blowdown (NPDES 009 and 010) will be taken from the cold side of the circulating water system and will be discharged directly into the existing discharge canal but downstream of the intake for the new units. NPDES numbers refer to discharge serial numbers as listed in the draft NPDES permit for Units 4 and 5. Maximum 2-hour average discharge temperature will be 35.6°C (96°F).

Preliminary calcium hardness data indicate that the cooling towers can be expected to operate at 1.1 to 1.2 cycles of concentration. Makeup and blowdown for this range of operation are as follows:

	Normal (66% load)	Peak (100% load)
	gpm(dm^3/s)	
Blowdown	61,142 (3,856)	56,727 (3,578)
Makeup	68,000 (4,289)	68,000 (4,289)

Quality of the cooling tower blowdown will be as presented in Table 40. The predicted temperature range of cooling tower blowdown is presented in Table 41.

CHEMICAL AND BIOCIDE WASTES

Wastewaters generated during plant operation and maintenance and planned disposal methods are summarized in Figure 26. Rates are presented for 100 percent and 66 percent load factors.

The EPA has promulgated maximum allowable discharge standards for new steam electric power generating units (40 CFR 423). These regulations set forth specific discharge limitations for separate plant processes (e.g., cooling tower blowdown, low volume wastes). The parameters coverage in this regulation are pH, suspended solids, and oil and grease for most processes. Metal cleaning wastes and boiler blowdown have additional standards for copper and iron. Cooling tower blowdown standards cover residual chlorine and corrosion inhibitors. Effluent guidelines and standards for steam electric generating are summarized in Table 41a.

FPCR4/5-RSUM.2/RVTB40.1
6/27/80

Table 40. Quality of Cooling Tower Blowdown for Crystal River Plant Units 4 and 5

Constituent	Cooling Tower Blowdown
Ca, mg/l as $CaCO_3$	1,200
Mg, mg/l as $CaCO_3$	5,330
Na, mg/l as $CaCO_3$	24,024
M Alk, mg/l as $CaCO_3$	157
SO_4, mg/l as $CaCO_3$	2,909
Cl, mg/l as $CaCO_3$	27,587
NO_3, mg/l as $CaCO_3$	1
SiO_2, mg/l as such	1
TSS, mg/l as such	30
Cl_2, mg/l as such	0.2 average 0.5 maximum
T-PO_4, mg/l as P	10
pH	8.0 to 8.5
Maximum 2-Hour Average Temperature, °C (°F)	35.6° (96°)

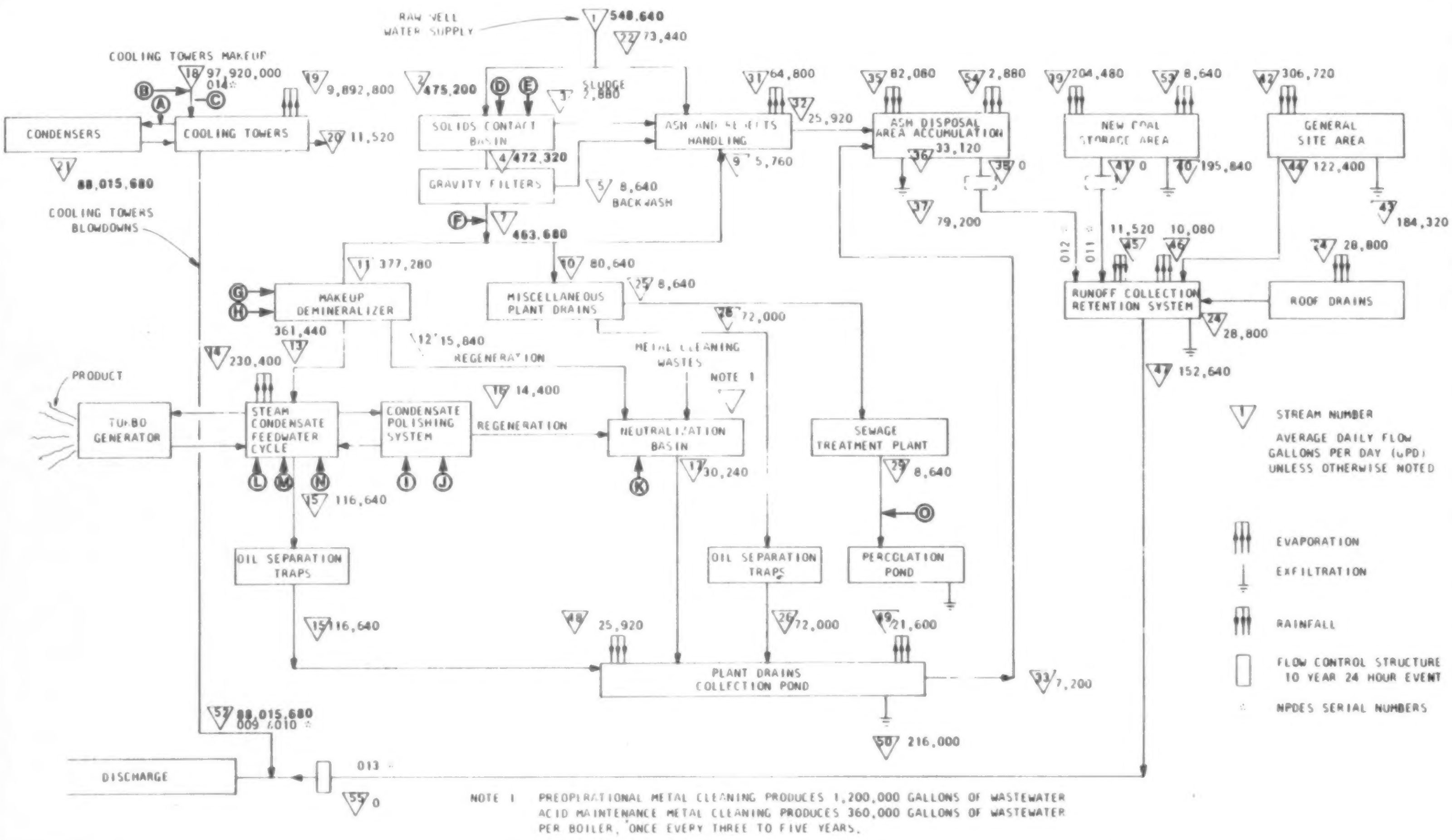
Source: Black and Veatch, 1980.

Table 41. Temperature Range of Cooling Tower Blowdown for Crystal River Units 4 and 5*

Month	Lowest		Highest	
	°F	°C	°F	°C
January	49	9.4	86	30.0
February	49	9.4	86	30.0
March	55	12.8	88	31.1
April	62	16.7	90	32.2
May	70	21.1	90	32.2
June	76	24.4	96	35.6†
July	83	28.3	96	35.6†
August	83	28.3	96	35.6†
September	76	24.4	92	33.3
October	64	17.8	90	32.2
November	53	11.7	89	31.7
December	51	10.6	88	31.1

* Based on Units 1, 2, and 3 operating at maximum capability.
† These represent maximum 2-hour average temperatures.

Source: Black and Veatch, 1980.


RAW WELL WATER SUPPLY
1 548,640
22 73,440
COOLING TOWERS MAKEUP
18 97,920,000
014
A
B
C
CONDENSERS
COOLING TOWERS
19 9,892,800
20 11,520
21 88,015,680
COOLING TOWERS BLOWDOWNS
2 475,200
D
E
3 SLUDGE 2,880
SOLIDS CONTACT BASIN
4 472,320
GRAVITY FILTERS
5 8,640 BACKWASH
F
7 463,680
ASH AND REJECTS HANDLING
31 64,800
32 25,920
9 5,760
11 377,280
G
H
MAKEUP DEMINERALIZER
361,440
13
14 230,400
12 15,840
REGENERATION
10 80,640
MISCELLANEOUS PLANT DRAINS
25 8,640
28 72,000
METAL CLEANING WASTES
NOTE 1
PRODUCT
TURBO GENERATOR
STEAM CONDENSATE FEEDWATER CYCLE
L
M
N
CONDENSATE POLISHING SYSTEM
I
J
16 14,400
REGENERATION
NEUTRALIZATION BASIN
K
17 30,240
15 116,640
OIL SEPARATION TRAPS
15 116,640
OIL SEPARATION TRAPS
26 72,000
48 25,920
PLANT DRAINS COLLECTION POND
49 21,600
50 216,000
33 7,200
SEWAGE TREATMENT PLANT
29 8,640
O
PERCOLATION POND
35 82,080
54 2,880
ASH DISPOSAL AREA ACCUMULATION
36 33,120
38 0
37 79,200
39 204,480
53 8,640
NEW COAL STORAGE AREA
41 0
40 195,840
42 306,720
GENERAL SITE AREA
44 122,400
43 184,320
012
011
45 11,520
46 10,080
RUNOFF COLLECTION RETENTION SYSTEM
ROOF DRAINS
24 28,800
24 28,800
47 152,640
52 88,015,680
009 010
DISCHARGE
013
55 0
STREAM NUMBER
AVERAGE DAILY FLOW GALLONS PER DAY (GPD) UNLESS OTHERWISE NOTED
EVAPORATION
EXFILTRATION
RAINFALL
FLOW CONTROL STRUCTURE 10 YEAR 24 HOUR EVENT
NPDES SERIAL NUMBERS

NOTE 1 PREOPERATIONAL METAL CLEANING PRODUCES 1,200,000 GALLONS OF WASTEWATER ACID MAINTENANCE METAL CLEANING PRODUCES 360,000 GALLONS OF WASTEWATER PER BOILER, ONCE EVERY THREE TO FIVE YEARS.

Figure 26

PLANT CHEMICAL USE DIAGRAM

SOURCE: Black and Veatch, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

LEGEND FOR FIGURE 26

Key	Chemical	Kg/d (PPD) 66% LF	Kg/d (PPD) 100% LF
A	Chlorine	212 (466)	212 (466)
B	66° Baume Sulfuric Acid	N/A	N/A
C	Organic Phosphate	3,118 (6,875)	5,121 (11,289)
D	Lime [93% $Ca(OH_2)$]	320 (700)	440 (970)
E	Polyelectrolyte	0.8 (1.7)	1.0 (2.3)
F	Chlorine	2.2 (6)	4.1 (9)
G	100% Sodium Hydroxide	110 (235)	160 (366)
H	66° Baume Sulfuric Acid	340 (740)	510 (1,120)
I	100% Sodium Hydroxide	50 (110)	75 (160)
J	66° Baume Sulfuric Acid	160 (360)	240 (540)
K	100% Sodium Hydroxide	100 (210)	150 (325)
L	Hydrazine	1.4 (3)	1.8 (4)
M	Ammonia	27 (60)	41 (90)
N	Trisodium Phosphate	0.4 (1)	0.4 (1)
O	Chlorine	0.4 (1)	0.4 (1)

Table 41a. U.S. Environmental Protection Agency Standards of Performance for New Sources: Maximum Allowable Discharge Concentrations by Waste Source^{1,2}

	Effluent Characteristics														
	Total Suspended Solids		Oil & Grease		pH	PCB^{4}	Copper, Total		Iron, Total		Free Available Chlorine^{5}		Zinc, Chromium, Phosphorus, and Other Corrosion Inhibitors		Heat
Waste Source	Daily Max.	Daily Ave.	Daily Max.	Daily Ave.	Allow. Range		Daily Max.	Daily Ave.	Daily Max.	Daily Ave.	Max. Instantaneous	Chlorination Period Ave.	Daily Max.	Daily Ave.	
1. All discharges					6.0-9.0	ND^{6}									
2. Low volume wastes*	100mg/l	30mg/l	20mg/l	15mg/l											
3. Bottom ash transport water*	100mg/l	30mg/l	20mg/l	15mg/l											
4. Fly ash transport water*	ND^{6,9}	ND^{6,9}	ND^{6,9}	ND^{6,9}											
5. Metal cleaning wastes and boiler blowdown*	100mg/l	30mg/l	20mg/l	15mg/l			1 mg/l	1 mg/l	1 mg/l	1 mg/l					
6. Cooling tower blowdown^{10}											0.5mg/l	0.2mg/l	NDA^{6}	NDA^{6}	
7. Main Condenser*															ND ^{6,9,11}
8. Material storage runoff^{12}	50mg/l^{9}	50mg/l^{9}			6.0-9.0										
9. Construction runoff^{12}*	50mg/l^{9}	50mg/l^{9}			6.0-9.0										

FOOTNOTES FOR TABLE 41a.

[1] The quantity of pollutants discharged from waste sources 1-6 shall not exceed the quantity determined by multiplying the flow from the waste source times the concentration in the table.

[2] In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

[3] Daily Maximum: Maximum 24-hour value: Daily Average: Average value for 30 consecutive days.

[4] PCB: Polychlorinated biphenyl compounds.

[5] Neither free available chlorine nor total residual clorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the Regional Administrator that the units in a particular location cannot operate at or below this level of chlorination.

[6] NDA: No detectable amount and ND: No discharge.

[7] Include, but are not limited to wastewaters from wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes, and blowdown from recirculating house service water systems.

[8] The quantity of pollutants discharged in bottom ash transport water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the above concentrations and dividing the product by 20.

[9] Limitations remanded and set aside by the United States Court of Appeals for the Fourth Circuit on July 16, 1976.

[10] Blowdown shall mean the minimum discharge of recirculating cooling water for the purpose of discharging materials contained in the process, the further buildup of which would cause concentrations or amounts exceeding limits established by best engineering practice.

[11] There shall be no discharge of heat from the main condensers except heat may be discharged in blowdown from recirculated cooling water systems provided the temperature at which the blowdown is discharged does not exceed at any time the lowest temperature of recirculated cooling water prior to the addition of the makeup water.

[12] Any untreated overflow from facilities, constructed and operated to treat the volume of material storage runoff and construction runoff which results from a 10-year, 24-hour rainfall event, shall not be subject to the pH and total suspended solids limitations stipulated for this waste source.

pH measured in standard units
mg/l—milligrams per liter
*These standards do not apply to the Crystal River Units 4 and 5 plant, as designed.

Source: U.S. Environmental Protection Agency "Steam Electric Power Generating Point Source Category: Effluent Guidelines and Standards," Federal Register, Volume 39, No. 196, October 8, 1974. 40 CFR Part 423.

Cooling tower blowdown will not contain chemical corrosion inhibitors. Makeup water will be treated by an alkaline-organic phosphate method of conditioning that will conform to the following quality control limits:

pH	8.0 to 8.5
M-Alk as $CaCO_3$	200 mg/l
Calcium Hardness as $CaCO_3$	1,200 mg/l

A proprietary organic phosphate scale inhibitor will be used to prevent excess scale. A residual phosphate concentration of up to 10 mg/l will be present in the blowdown as a result of the phosphate scale inhibitor. Mechanical condenser tube cleaning systems will also be employed. Sulfuric acid treatment will be used periodically for descaling.

The circulating water will be shock chlorinated to control the growth of fouling organisms, algae, and bacterial slimes in the condenser and cooling tower. Shock chlorination will be carefully controlled to prevent the chlorination of two generating units simultaneously and will be limited to one to three periods per day per unit of chlorine solution feed. Actual solution feed will be limited to 20 minutes or less per period. The chlorine feed rates will be controlled to meet the NPDES limitation of 0.10 mg/l total residual chlorine in the blowdown, and/or dechlorination facilities will be required.

The following is a summary of the anticipated chemical dosages for scale and biological control:

	Peak Operation		Normal Operation	
	kg/day	lb/day	kg/day	lb/day
Scale Inhibitor	5,121	11,289	3,118	6,875
Chlorine	212	466	212	466
66° Baume' Sulfuric Acid	Intermittent use to be determined based on operational experience.			

No additional treatment of cooling tower blowdown is planned prior to its discharge into the existing discharge canal.

Hydrazine, ammonia, and trisodium phosphate will be fed to Units 4 and 5 condensate-feedwater-steam cycles to minimize scaling and corrosion. Hydrazine consumption is estimated at 1.8 kilograms (4 pounds) per day at peak load and 1.4 kilograms (3 pounds) per day at normal load. Ammonia consumption is estimated to be 41 kilograms (90 pounds) per day at peak plant load and 27 kilograms (60 pounds) per day at normal plant load. Trisodium phosphate consumption is estimated to be less than 0.5 kilograms (1 pound) per day at all plant loads.

Wastewater resulting from low-volume wastes and boiler blowdown containing principally phosphates, iron, copper, ammonia, suspended solids, and high pH will be discharged to the plant drains collection pond which will not discharge to surface waters.

Water used to sluice and transport bottom ash and pyrites will be reclaimed where possible and recycled. Water used in the system will evaporate or accumulate in the ash. Ash transport water will not be discharged to surface waters.

Wastewater will also be produced from preoperational and operational metal cleaning. Preoperational metal cleaning will use acidic and alkaline chemicals. Acid metal cleaning will use a solution of hydroxyacetic-formic acid for the preboiler system and inhibited hydrochloric acid for the boiler system, a neutralizer step, and flushing with demineralized water. Alkaline metal cleaning will use a sodium phosphate solution and subsequent flushing with demineralized water. These processes will produce about 4,500 cubic meters (1,200,000 gallons) of wastewater over a period of several days to be discharged to the neutralization basin. Periodic metal cleaning will be performed at 3- to 5-year intervals. About 1,400 cubic meters (360,000 gallons) of wastewater will be discharged to the neutralization basin over a period of 5 days per event.

The plant service water pretreatment system will produce about 43.6 cubic meters (11,520 gallons) of wastewater per day. This wastewater will be pumped to the bottom ash dewatering equipment where the suspended solids will be separated from the fluid and disposed with the bottom ash solids to a landfill. The liquid portion will be used as makeup to the bottom ash sluice system. Water pretreatment wastewater will not be discharged to navigable waters.

Wastewater from the demineralization system will consist of unreacted sulfuric acid and sodium hydroxide, along with sodium and sulfate salts of the ions removed from the ion exchange resins during regeneration. Wastewaters are expected to average less than 1.0 liters per second. It will be routed to the neutralization basin where the pH will be adjusted to between 6.5 and 9.0. Neutralized water will then be discharged to the plant drains collection pond.

Condensate polishing system wastewaters will be similar to those produced in the demineralization system. These waters will also be routed to the neutralization basin and, after pH adjustment, to the plant drains collection pond.

Chemical laboratory wastes are expected to be less than 0.40 cubic meters (100 gallons) per day. The principal chemical reagents will include sodium and ammonium hydroxide; hydrochloric, nitric, sulfuric and ethylenediaminetetraacetic acids; and sodium carbonate. Chemical laboratory wastes will be collected and discharged to the neutralization basin.

STORAGE RUNOFF

Runoff from material storage areas (NPDES 011, 012, and 013) will be segregated from general site drainage and will only discharge runoff which exceeds storage pond capacity which is in excess of that produced by the 10-year, 24-hour storm event.

The proposed coal storage area (see Figure 20) will be diked and drained by a 1.2-hectare (3-acre) perimeter drainage ditch. The ditch will not be lined with impervious material. Stored rainfall up to 8.37 inches (10-year, 24-hour rainfall event) will be disposed of by evaporation and exfiltration. Excess rainfall (NPDES 011) will be discharged to the runoff collection ditch system.

Fuel oil storage tanks will be diked sufficiently to contain the entire volume of the tank plus a quantity of rainfall resulting from a 10-year, 24-hour storm rainfall. The dike will be clay-lined and drained by a buried pipe. The truck unloading area will be drained to the containment dike. Oil-water separators will be used to recover any oil spills.

WASTE TREATMENT AND DISPOSAL SYSTEMS

GENERAL CONCEPT

Segregation and reuse of waste streams is the primary concept behind the design of the waste treatment and disposal systems for the proposed facility. Wastewater from the plant drains collection pond is used for ash dust suppression and compaction; low-volume wastes and metal-cleaning wastes are segregated and pretreated; material storage pile runoff is segregated from general site runoff; oil-water separators are used to recover oil spills, treat rainfall runoff, and pretreat process wastewaters.

NEUTRALIZATION BASIN

A neutralization basin with a volume of 380 cubic meters (100,000 gallons) is planned for pretreatment of metal-cleaning wastes, ion exchange regeneration wastes, and laboratory drains. This basin will be used for neutralization of wastes on a batch basis. The basin will be sized to contain the largest volume of chemical cleaning solution wastes expected in one batch and will be constructed of reinforced concrete with a chemical-resistant membrane overlaid with acid-resistant brick and mortar. A mixer will be mounted on a walkway spanning the open-topped basin. Sulfuric acid and sodium hydroxide will be available from the demineralizer system regeneration equipment for neutralization of basin contents.

The basin will require several days to fill during normal plant operations as discharges will primarily consist of ion-exchange regeneration wastes. These wastes will tend to be self-neutralizing and will require minimal chemical addition. Neutralized regeneration wastes will be routed to the plant drains collection pond to evaporate and exfiltrate.

Batch neutralization of preoperational chemical-cleaning wastes will produce approximately 3,200 kilograms (7,000 pounds) of precipitated metal hydroxides. Acid cleaning will produce about 950 kilograms (2,100 pounds) of precipitate every 3 to 5 years. The neutralization basin will discharge to the plant drains collection pond. A determination will be made prior to discharge of metal-cleaning precipitates to the plant drains collection pond as to whether this material is hazardous. If it is determined that this material is hazardous, it will be disposed of in an approved hazardous waste landfill. If not hazardous, it will be discharged to the plant drains collection pond.

PLANT DRAINS COLLECTION POND

The plant drains collection pond influents will include neutralization basin wastewaters, steam-cycle liquid losses (leaks from pumps, piping, and valves in the cycle, plus boiler blowdown), and other low-volume wastes carried via the miscellaneous plant drains. The plant drains collection pond will not require chemical additions for further treatment of the wastewaters introduced.

The plant drains collection pond is designed to contain all wastewater influents and direct rainfall. The estimated area and volume of the plant drains collection pond are 2.6 hectares (6.5 acres) and 24,000 cubic meters (19.5 acre-feet), respectively. This volume is equivalent to four times the 10-year, 24-hour rainfall event of 21.3 centimeters (8.37 inches). There will be no discharge from the pond, as evaporation and exfiltration exceed the wastewater influents and expected rainfall.

SANITARY WASTE SYSTEM

The sewage treatment plant will be an 11.3 cubic meter (30,000 gallon) per day, packaged, activated sludge unit which employs the extended aeration process method of treatment. The facility will be designed to achieve 90 percent reduction of BOD and suspended solids. Chlorine consumption is estimated to be 0.9 kilograms (2 pounds) per day.

Maximum loading of the sewage treatment facility will occur when Unit 4 is operating and Unit 5 is under construction. During that time, approximately 1,200 construction, permanent, and temporary personnel are estimated to account for about 25,750 gpd.

During commercial operation of both units, an estimated 132 permanent and temporary personnel will provide about 8,640 gallons of sewage per day. The design of the sewage system will allow efficient operation during normal load after construction by dewatering one aeration chamber-clarifier chamber pair. The secondary treatment effluent will be discharged to a percolation-evaporation pond. The pond will have a capacity of 1.12 acre-feet. Waste sludge will be disposed of either off site by a contract service or on site in the ash disposal area.

SOLID WASTE: SOURCES, TREATMENT, HANDLING, TRANSPORTATION, AND DISPOSAL SYSTEMS

Table 42 presents the kinds and amounts of solid wastes which will be produced by Units 4 and 5.

Bottom ash will be collected in a water-sealed hopper and hydraulically sluiced to an intermediate transfer tank. Coal pulverizer rejects (pyrites) will be collected in small hoppers adjacent to each pulverizer. The pyrites will be conveyed hydraulically from each pulverizer hopper to the same intermediate transfer tank used for bottom ash. The bottom ash and pyrites will then be pumped with centrifugal slurry pumps to the ash dewatering bins as shown in Figure 27. Figure 28 summarizes, schematically, the bottom ash and pulverizer rejects collection systems. The water pretreatment sludge will be pumped directly to the ash water settling tank.

Fly ash will be conveyed by a vacuum system to a storage site located on the plant site as depicted in Figure 29.

Dewatered bottom ash, pulverizer rejects, economizer ash, pretreatment system sludge, and dry precipitator fly ash produced during the operating life of Units 4 and 5 will be transported by truck or conveyor to an on-site storage area. The total storage development will consist of approximately 380,700 square meters (95 acres) at a total depth of 12 meters (40 feet). The storage area will be developed in eighty 150-square meter (20-acre) segments. Each segment will be filled to a height of 12 meters (40 feet) above existing grade. The storage pile slopes will be dressed with soil material of sufficient depth to support vegetation. At the time the segment is developed to design height, the top surface will be sloped to drain and dressed with soil materials.

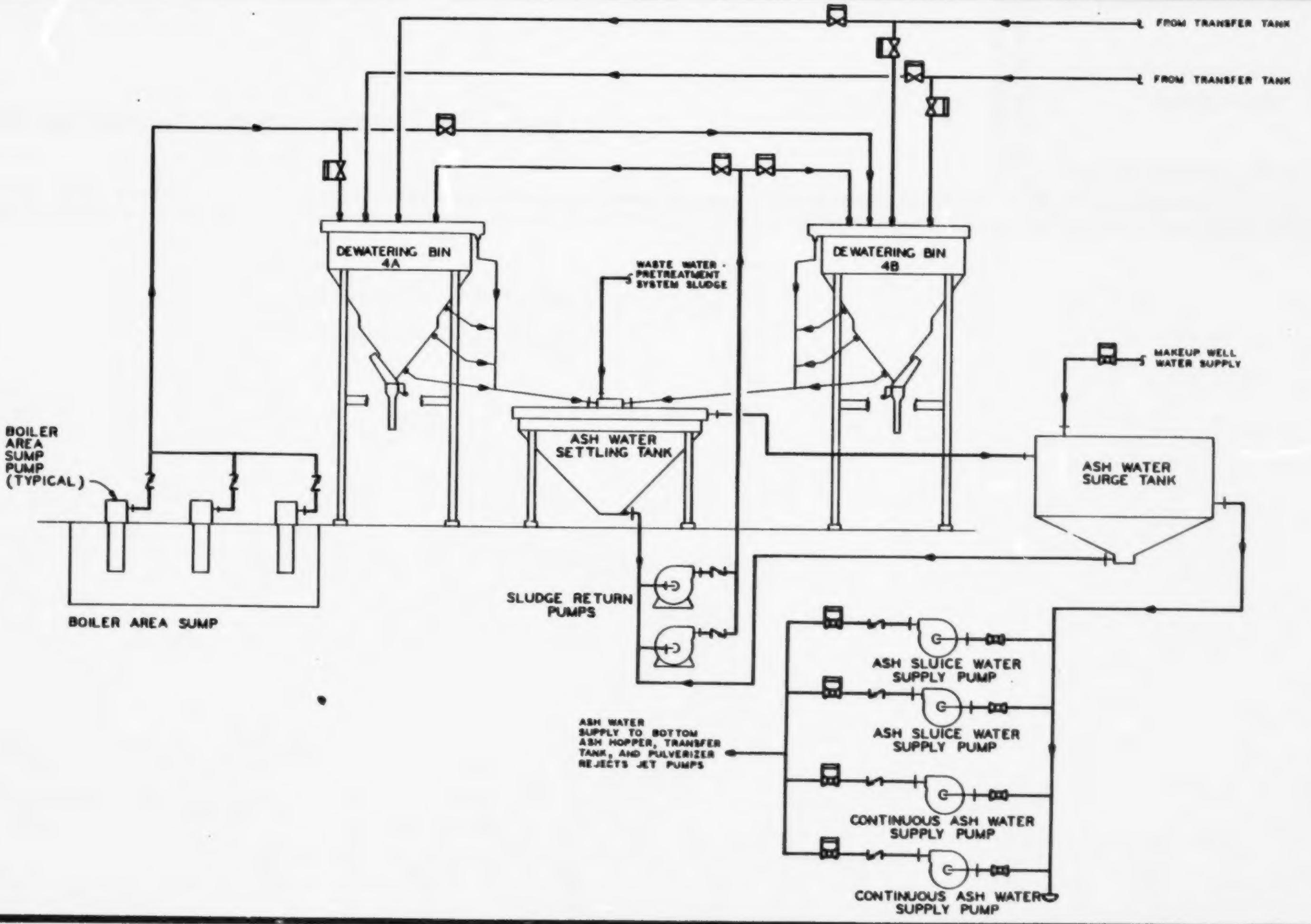
FPCR4/5-RSUM.2/RVTB42.1
6/2/80

Table 42. Crystal River Plant Solid Waste Quantities, Units 4 and 5

Constituent	Average (66%) Capacity		Peak (100%) Capacity	
	Mg/Day	(103 Lb/Day)	(Mg/Day)	(103 Lb/Day)
Bottom Ash*	147	(324)	223	(492)
Economizer Fly Ash*	29	(65)	44	(98)
Precipitator Fly Ash*	560	(1,234)	849	(1,872)
Pulverizer Rejects*	47	(103)	70	(154)
Pretreatment System Solid Waste	.7	(1.5)	(1.0)	(2.1)
Total Solids to Ash Storage	783.7	(1,727.5)	1,187.0	(2,618.1)
Total Volume of Solids to Storage	528 m^3	(18,630 ft^3)		

* Ash and rejects quantities based on design coal blend.

Source: Black and Veatch, 1978.



FROM TRANSFER TANK
FROM TRANSFER TANK
DEWATERING BIN 4A
DEWATERING BIN 4B
WASTE WATER PRETREATMENT SYSTEM SLUDGE
MAKEUP WELL WATER SUPPLY
BOILER AREA SUMP PUMP (TYPICAL)
ASH WATER SETTLING TANK
ASH WATER SURGE TANK
BOILER AREA SUMP
SLUDGE RETURN PUMPS
ASH SLUICE WATER SUPPLY PUMP
ASH SLUICE WATER SUPPLY PUMP
ASH WATER SUPPLY TO BOTTOM ASH HOPPER, TRANSFER TANK, AND PULVERIZER REJECTS JET PUMPS
CONTINUOUS ASH WATER SUPPLY PUMP
CONTINUOUS ASH WATER SUPPLY PUMP

Figure 27
ASH DEWATERING BINS

SOURCE: BLACK AND VEATCH, 1980.

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

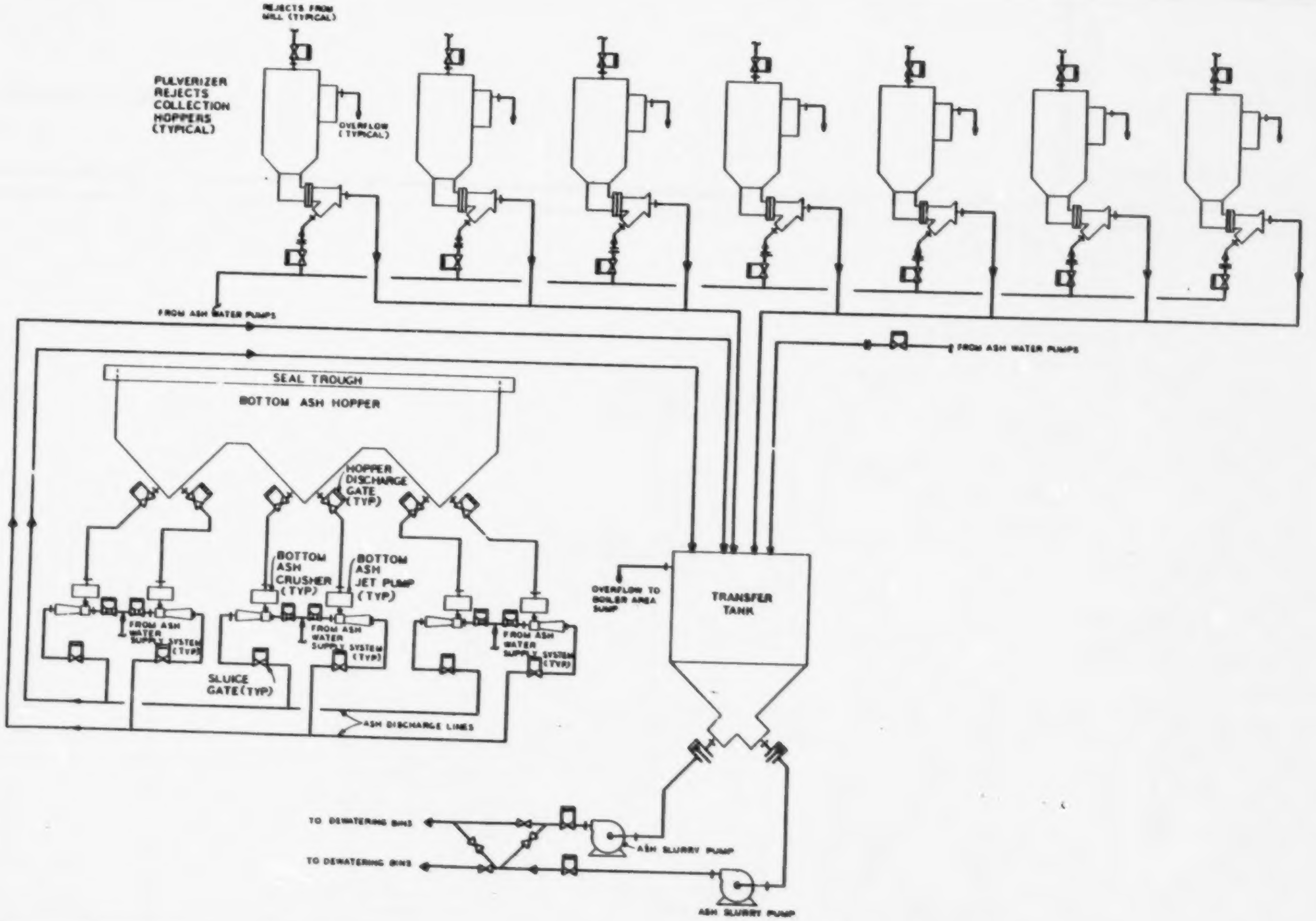

REJECTS FROM MILL (TYPICAL)
PULVERIZER REJECTS COLLECTION HOPPERS (TYPICAL)
OVERFLOW (TYPICAL)
FROM ASH WATER PUMPS
FROM ASH WATER PUMPS
SEAL TROUGH
BOTTOM ASH HOPPER
HOPPER DISCHARGE GATE (TYP)
BOTTOM ASH CRUSHER (TYP)
BOTTOM ASH JET PUMP (TYP)
FROM ASH WATER SUPPLY SYSTEM (TYP)
SLUICE GATE (TYP)
ASH DISCHARGE LINES
OVERFLOW TO BOILER AREA SUMP
TRANSFER TANK
TO DEWATERING BINS
TO DEWATERING BINS
ASH SLURRY PUMP
ASH SLURRY PUMP

Figure 28
BOTTOM ASH AND PULVERIZER REJECTS HANDLING

SOURCE: BLACK AND VEATCH, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

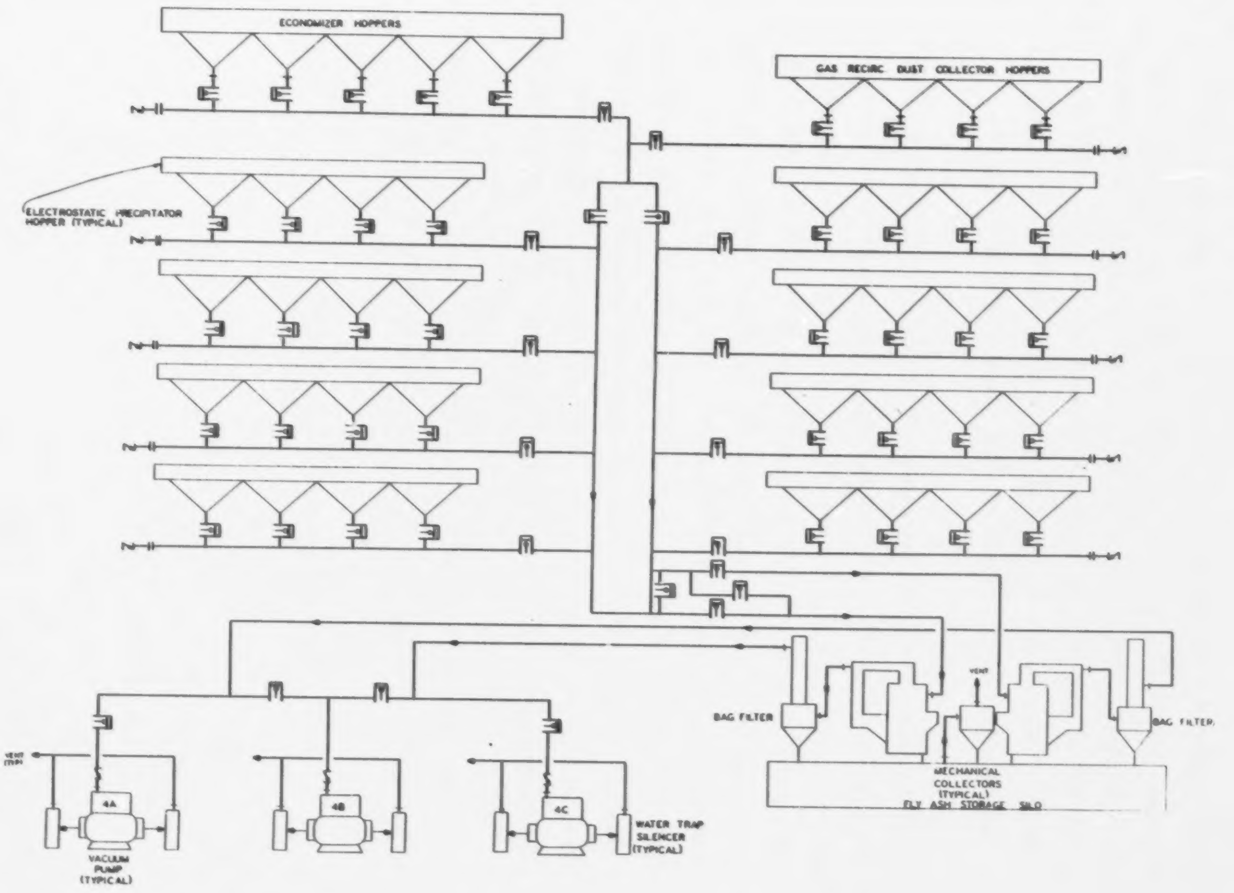

ECONOMIZER HOPPERS
GAS RECIRC DUST COLLECTOR HOPPERS
ELECTROSTATIC PRECIPITATOR HOPPER (TYPICAL)
BAG FILTER
VENT
BAG FILTER
MECHANICAL COLLECTORS (TYPICAL)
FLY ASH STORAGE SILO
VENT (TYP)
4A
4B
4C
VACUUM PUMP (TYPICAL)
WATER TRAP SILENCER (TYPICAL)

Figure 29
FLY ASH HANDLING

SOURCE: BLACK AND VEATCH, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

The soil material used for cover will be stockpiled in unused portions of the ash storage area. The active ash storage will be compacted and sloped to insure minimum infiltration. A toe canal will be constructed along the perimeter of the active storage segment to receive surface stormwater runoff. The stormwater runoff in excess of the 10-year, 24-hour storm event will be diverted to the canal retention system.

The on-site ash storage area will be sufficient for the storage of all bottom ash, pulverizer rejects, economizer ash, pretreatment system sludge, and precipitator fly ash produced for 24 years of the 30-year operating life of Units 4 and 5. This conclusion is based on the average generation capacity using the proposed design coal which is a 50/50 mixture of typical eastern and western coals. Fly ash from these units will be handled dry. This will allow sale of fly ash for such purposes as: mineral filler in asphalt paving, additive in concrete and concrete products, Pozzolin insoil stabilization, raw material in lightweight aggregate, grouting agent, fill for development, and agricultural applications. If 26.5 percent of fly ash from Units 4 and 5 is sold, then the on-site storage area will be sufficient for the storage of all ash and pretreatment system sludge for 30 years operation at average capacity.

AIR EMISSIONS

Each unit will burn approximately 294,000 kilograms (648,000 pounds) per hour of coal based on the typical coal analysis. Combustion at this load will produce approximately 3,277,209 kilograms (7,224,887 pounds) per hour of combustion gases which will consist primarily of nitrogen, carbon dioxide, water vapor, oxygen, particulate matter, sulfur dioxide, and nitrogen oxides. The constituents of the combustion gas are shown in Table 43.

The applicable EPA and FDER emission rate limitations (1977-1978) are summarized as follows:

Pollutant	Emission Rate Limitation
Sulfur Dioxide	520 Nanograms per joule (1.2 lb per million Btu)
Particulate Matter	43 Nanograms per joule (0.1 lb per million Btu)
Nitrogen Dioxide	300 Nanograms per joule (0.7 lb per million Btu)
Opacity	20 percent*

*The opacity shall not exceed 20 percent except that 40 percent opacity shall be permissible for not more than 2 minutes in any hour.

CONTROL SYSTEMS DESCRIPTION

OXIDES OF NITROGEN CONTROL

NO_x from Units 4 and 5 steam generators will be controlled to meet emission standards by utilizing features to minimize NO_x formation during combustion. These design features will include one or more of the following:

1. Dual register burners (staged combustion);
2. Compartmented windbox (improved combustion control);
3. Large furnace and widely-spaced burners (reduced temperatures);
4. Overfire heat; and
5. Limiting heat input per burner.

Table 43. Combustion Products*

Combustion Product	Unit 4		Unit 5		Total	
	kg/h	(lb/h)	kg/h	(lb/h)	kg/h	(lb/h)
H_2O	195,955	(432,000)	195,955	(432,000)	391,910	(864,000)
CO_2	634,133	(1,398,000)	634,133	(1,398,000)	(1,268,266)	(2,796,000)
N_2	2,282,515	(5,032,000)	2,282,515	(5,032,000)	4,565,030	(10,064,000)
O_2	159,214	(351,000)	159,214	(351,000)	318,428	(702,000)
SO_2	2,880	(6,350)	2,880	(6,350)	5,760	(12,700)
NO_2	2,118	(4,670)	2,118	(4,670)	4,236	(9,340)
Cl_2	91	(200)	91	(200)	182	(400)
Particulate Emissions	303	(667)	303	(667)	606	(1,334)
TOTAL	3,227,209	(7,224,887)	3,227,209	(7,224,887)	6,554,418	(14,449,774)

*Based on peak coal consumption of 294,000 kilograms (648,000 pounds) per hour per unit, 20 percent excess air at 60 percent relative humidity, and 27°C (80°F) dry bulb (0.013 kilograms of moisture per kilogram of dry air).

Source: Black & Veatch, 1978.

The large furnace and widely-spaced burners increase the burner firing zone absorption area and decrease peaking combustion temperatures, thus minimizing NO_x formation.

The steam generators will be designed to operate such that the oxides of nitrogen emission rate expressed as nitrogen dioxide will not exceed 300 nanograms of nitrogen dioxide per joule (0.7 pound of nitrogen per million Btu) of heat input.

PARTICULATE CONTROL

Particulate matter generated during combustion will be removed in the electrostatic precipitator. Suggested design parameters for the electrostatic precipitator installation are shown in Table 44. At full load, the maximum design ash content of the coal, more than 99.6 percent of the fly ash will be removed from the combustion gases leaving the furnace.

A stack height of approximately 183 meters (600 feet) and a diameter of 6.86 meters (22.5 feet) for each unit is adequate to satisfy dispersion requirements. Each stack will be capable of discharging approximately 1,038 m^3/s (2,200,000 ACFM) of flue gas at 127°C (260°F) and 28.1 m/s (99.2 f/s). The flue gas flowrate and emissions are presented in Table 45.

The coal and ash handling system will generate particulate matter from handling western coal and dry fly ash. The major emission points will be the coal conveyor transfer points, crusher house, coal silos, fly ash silos, fly ash vacuum pump discharge and emergency reclaim hopper.

Coal transfer will be by covered conveyor from the existing coal handling area to Units 4 and 5 storage. At the storage area, coal will be blended and transferred to the crusher house by covered conveyor. A total of four transfer points are designed.

Table 44. Suggested Design Parameters for Electrostatic Precipitator

Precipitator efficiency (%)	99.6	
Gas flow, acms (ACFM)	1,048	(2,221,000)
Gas temperature, C (F)	130	(226)
Gas velocity, meters per second (feet per second)	0.91	(3)
Effective front end area, meters^2 (feet^2)	1,146	(12,339)
Plate heights, meters (feet)	9.75	(32)
Effective width, meters (feet)	117.65	(386)
Aspect ratio [four 2.74 meters (9 feet) and one 3.66 meters (12 feet) field]	1.5	
Field depth, meters (feet)	14.63	(48)
Effective volume, meters^3 (feet^3)	16,794	(593,000)
Duct width, meters (inches)	0.23	(9)
Number of ducts	515	
Total plate area, meters^2 (feet^2)	146,975	(1,582,000)
Collecting area, meters^2/acms (feet^2/10^3 ACFM)	140	(712)
Number of transformer rectifiers	80	
Number of bus sections	160	
Total power required, Mw	5.4	
Estimated precipitator dimensions, each (two precipitator/unit)		
Length, meters (feet)	17.68	(58)
Width, meters (feet)	64.01	(210)
Height, meters (feet)	15.24	(50)
Overall height, meters (feet) (including hoppers)	21.34	(70)

Source: Black and Veatch, 1977.

Table 45. Flue Gas Flow Rates and Emissions at Peak Load

Heat Input	Unit 4 (695 Mw)	Unit 5 (695 Mw)
GJ/h (10^6 Btu/h)	7,032 (6,665)	7,032 (6,665)
Gas Temp C(F)	126.7°C (260°C)	126.7 (260)
Gas Flow		
kilograms/hour (lb/h)	3,277,209 (7,224,887)	3,277,209 (7,224,887)
acms (ACFM)	1,038 (2,200,000)	1,038 (2,200,000)
Stack Exit Velocity		
meters/second (feet/second)	28.1 (92.2)	28.1 (92.2)
Stack I.D., meters (feet)	6.86 (22.5)	6.86 (22.5)
Stack Height, meters (feet)	182.9 (600)	182.9 (600)
Pollutant Emissions		
SO_2, kilograms/hour (pounds/hour)	3,537 (7,798)	3,537 (7,798)
Particulate Emissions		
kilogram/hour pounds/hour	303 (667)	303 (667)

Source: Black & Veatch, 1978.

The fly ash will be handled dry to enable possible commercial sale. As a consequence, possible fly ash emission may occur in the storage and transfer. Two points of discharge that have been identified are the fly ash silo and fly ash discharge system.

Regulated emission limitations for coal and fly ash handling are contained in the Environmental Protection Agency Regulations 40 Code of Federal Regulations, part 60 subpart Y, and the Florida Department of Environmental Regulations' rules contained in Chapter 17-2 F.A.C. The applicable regulations are presented in Table 46.

Control of dust will be accomplished by use of either of the following methods:

1. Dust suppression by application of a wetting agent, or
2. Dust collection in a dry state by air transport to a bag filter unit.

Wetting agent type dust suppression systems consisting of pre-engineered modules which incorporate both water handling components and automatic spray controls are available. A typical spray solution contains 3,000 parts of water to one part of an organic ether detergent. The rate of spray application is about 3.4 liters per metric ton (1.2 gallons per ton) of coal which increases total surface moisture by about 0.5 percent.

Dry dust collection is accomplished by removal of dust laden air from enclosed transfer points into a duct system which terminates into a bag filter unit. The collection process creates a slight negative pressure within enclosed transfer points.

Bag filters operate by passing dust laden air through a fabric at low velocity. Removal is obtained by build up of a cake or mat on the fabric dirty air surface. Good collection efficiencies can be maintained for dust particle sizes to 1 micron and smaller.

Table 46. Applicable Regulations for Coal and Ash Handling System

Particulate Emission Point	Number of Emission Points	Applicable Regulation	Type of Limitation
Transfer Point	5	Ch. 17-2.04(2)	Process weight
Coal Crusher	1	Ch. 17-2.04(2)	Process weight
Coal Storage Silos	4	Ch. 17-2.04(2)	Process weight
Fly Ash Silos	2	Ch. 17-2.04(2)	Process weight
Fly Ash Vacuum Pump Discharge	2	Ch. 17-2.04(2)	Process weight
Emergency Reclaim Hopper	1	Ch. 17-2.04(2)	Process weight
Coal Storage Area		Ch. 7-2.04(3)	Fugitive dust
Fly Ash Disposal		Ch. 7-2.04(3)	Fugitive dust

Source: Black and Veatch, 1978.
Environmental Science and Engineering, Inc., 1980.

As dust is collected on the fabric, resistance to air flow increases. Periodically, the fabric is cleaned by rapping, shaking, or air pulse vibration of the bag to drop the bulk of the adhering material to an underlying collection hopper. Typically, units for coal dust collection are designed with air (cfm) to cloth (square feet) ratios of 7-9 to 1 for air pulse type units and 3-5 to 1 for shaker type units. Fabric material for coal dust collection is generally polypropylene, polyester, or polyesterdacron felt.

The suggested design specification for the bag filter units are based upon an assumed inlet loading of 0.4 grams/1,000m^3/second (13 grams per acfm). An efficiency of 99.9 percent is the recommended performance requirement. Presented in Table 47 is the estimated emissions from the coal and ash handling discharge points.

SULFUR DIOXIDE

As indicated earlier, low-sulfur coal will be utilized to meet sulfur dioxide emission limitations. Sufficient space will be provided in the design for flue gas desulfurization (FGD) systems. The use of FGD will require as a minimum 800 additional acres for sludge disposal. In the event FGD is necessary, alternate sludge disposal sites will be provided.

Table 47. Particulate Emissions from Coal and Ash Handling

Source	Number of Discharges	Flow Rate Per Discharge		Emissions Per Discharge	
		m^3/sec	(cfm)	grams/sec	(lbs/hr)
Transfer Points	5	1.9	(4,100)	0.13	(0.5)
Crusher House	1	7.1	(15,000)	0.2	(1.7)
Coal Storage Silo	4	2.8	(5,900)	0.1	(0.7)
Fly Ash Silo	2	9.0	(19,000)	0.28	(2.2)
Fly Ash Vacuum Pump Discharge	2	1.4	(3,000)	0.04	(0.3)
Emergency Reclaim Hopper	1	3.3	(7,000)	0.1	(0.8)

Source: Black and Veatch, 1980.

CHAPTER VI

ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

CONSTRUCTION IMPACTS

INTRODUCTION

A total of 135 hectares (333 acres) of land will be cleared for construction of Crystal River Units 4 and 5, including the permanent ash storage area and the new access road and rail spur. Approximately 0.6 meters (2.0 feet) of organic muck and silt overburden will be removed in the vicinity of these structures, and roughly 140,000 cubic meters (180,000 cubic yards) of limestone fill will then be added. The plant area will be raised approximately 1.5 meters (5 feet) to an elevation of 3.4 meters (11 feet) above mean low water. The plant foundation will be supported by approximately 250 drilled piers of reinforced concrete. A small amount of dredging [less than 125 cubic meters (160 cubic yards)] will be required in the existing discharge canal for construction of a salt water make-up intake structure and a cooling tower blowdown structure. Major hydraulic dredging operations or the use of explosives are not expected.

A 48-month construction period for each of the two units is anticipated. Assuming an 24-month separation in commercial opening dates, the period of intensive construction activity (more than 100 employees) will persist for 5.5 years, during which time there will be an average of 664 construction workers on-site. Construction employment will exceed 1,000 persons for 1.5 years and will peak at 1,275 workers in early 1982.

WATER RESOURCES

Stormwater runoff from the plant site is currently minimal because of the excellent percolation of the Broward soil. Clearing, grading, and filling of the plant site area will decrease the percolation rate and thus increase storm runoff. The potential for soil erosion and sediment transport will also increase. A variety of mitigative measures will be employed to prevent sedimentation and turbidity effects, including the construction of detention ponds, diking of cleared and filled areas, and other state-of-the-art erosion control techniques such as berms, mulch, and sodding. Due to these controls and the absence of significant land slope, the sediment loadings to nearby marsh areas during construction are expected to be negligible as environmental impacts.

The small amount of dredging activity in the discharge canal will increase turbidity in the canal and adjacent areas, but this impact will be less than one month in duration. Construction may lead to some minor changes in surface water chemistry, such as increased pH and mineralization due to contact of runoff with the limestone fill, but there should be no violations of any promulgated water quality standards. Sanitary wastes at the construction site will be handled by portable chemical facilities and later by a sanitary sewage system (with secondary treatment and discharge to an evaporation/percolation pond). No point-source discharges will occur during construction. Other chemical and petroleum wastes will be disposed of in accordance with state and federal regulations. No environmental impacts are expected as a result of these waste disposal activities.

AIR QUALITY

The most significant air pollutant generated by heavy construction operations will be suspended particulate matter, in the form of fugitive dust. The quantity of dust emitted will depend on a large number of factors. A general estimate of emissions is 3.0 metric tons per hectare (1.2 ton per acre) per month of activity (U.S. Environmental Protection Agency, 1975). The majority of dust particles generated will settle near the source, although some will remain suspended. To mitigate fugitive dust impacts, Florida Power Corporation will take all reasonable precautions such as using water, oil, or dust-suppression chemicals where practicable on cleared areas and dirt roads. Water for such purposes will be available from the stormwater detention ponds. Given the expected 50 percent to 80 percent effectiveness of controls (Dunbar, 1975; Kosky, 1975) and the isolation of the site, fugitive dust generation will be a short-term impact of low significance. Ambient air quality standards for suspended particulates will not be exceeded beyond a few hundred feet from the construction activity (Kosky, 1975).

Vegetative wastes from land clearing operations will be burned on-site. To limit air quality impacts, burning will be conducted only during periods of excellent atmospheric dispersion and will comply with other State of Florida regulations. Burning will emit particulate matter, carbon monoxide, hydrocarbons, sulfur oxides, and nitrogen oxides, in quantities that depend upon factors such as the moisture content and arrangement of the debris. The resulting impacts on air quality will be minor and short-term. Exhausts of heavy equipment and truck traffic will also constitute sources of carbon monoxide and other combustion products, but will have low importance because of the isolation of the construction site and the low volume of existing traffic on local roads.

NOISE

Noise will be created during the construction project by the operation of heavy equipment on-site and by traffic to and from the project area. Based on research studies of construction noise (U.S. Environmental Protection Agency, 1971), the worst-case noise emission during the Crystal River construction project has been simulated mathematically and found equivalent to four noise sources operating simultaneously at 80, 80, 85, and 91 decibels (measured on the A-scale). The distance from the center of the construction site to the nearest noise-sensitive receptors is approximately 8 kilometers (5 miles). This distance will reduce the maximum sound level to 39 dBA, and the intervening vegetation will cause a further reduction to 29 dBA, which is indiscernible. The corresponding Noise Pollution Level (NPL) will be 20 dBA below the maximum that is "clearly acceptable." Thus, the noise impacts of the proposed construction project are not considered significant.

SOLID WASTE

An estimated 1,800 cubic meters (2,400 cubic yards) of solid waste other than land clearing debris will be generated by the proposed construction project. This material will include scrap lumber, scrap metal, crating, packaging, and field-office wastes. Most of these materials can be recycled, and will be stockpiled in areas where salvage operators can transport them off-site. Other solid wastes will be disposed at an existing landfill on the Florida Power property. The impacts of solid waste disposal will be insignficant because land utilization for this purpose will be minor and will involve an existing disposal area.

TERRESTRIAL ECOLOGY

The construction project at Crystal River will affect terrestrial ecosystems in two ways: loss of existing plant communities on 135 hectares (333 acres) of land at the plant site; and certain on- and off-site effects on wildlife. The plant communities lost will include 2.4 hectares (6 acres) of coastal hydric hammock, 22 hectares (55 acres) of hydric hammock, and 25 hectares (62 acres) of mesic hammock. The project will also take 60 hectares (148 acres) of slash pine flatwoods, 4.5 hectares (11 acres) of evergreen oak scrub, 10 hectares (25 acres) of freshwater marsh, and 11 hectares (26 acres) of ruderal land. In the early design stages of the project, the location of the plant site was shifted eastward to avoid substantial areas of coastal salt marsh, coastal hydric hammock, hydric hammock, and mesic forest. This design change is considered an important mitigative measure. Overall, the loss of natural vegetative communities is an impact of low significance because of the early successional status and disturbed state of most of the land to be cleared, and because the community types are widely represented in the region.

The only sensitive area likely to be affected by the project will be the coastal hydric hammock, which is distinguished by wetland soils and relatively old trees. The impacts will include clearing of 2.5 hectares (6.3 acres) and loss of a protective vegetation buffer. Florida Power Corporation will mitigate these impacts to a large extent by allowing maximum practical regrowth following construction.

The disruption of vegetative communities at the construction site will affect wildlife populations directly and indirectly. The more motile species of wildlife (e.g., opossum, raccoon, and deer) will leave the immediate vicinity of construction, whereas the clearing process will destroy other populations such as small mammals and various herpetofauna. Since most lands in the vicinity are already at or near carrying capacity for wildlife, the animals displaced from the construction site will be forced to compete with established populations elsewhere. The long-term result is that regional wildlife populations will decline roughly in proportion to the reduction in habitat. In general, the significance of wildlife habitat loss is not great because of the commoness of most of the species involved and the abundance of available forest habitat.

A biological opinion has been issued (March 16, 1979) by the U.S. Fish and Wildlife service concerning the impacts of the Florida Power project on the eastern indigo snake and the Florida manatee. They concluded that "the siting of Units 4 and 5 is not likely to jeopardize the continued existence of the indigo snake or the habitat which has been determined to be essential to the species." The agency recommended that the manatee be protected by imposing navigation limitations on coal barge transport.

The construction project potentially could have a variety of impacts upon plant and animal communities in nearby areas, although most of these impacts have been found insignificant. Reduction in the freshwater subsidy of nearby wetland areas, which would affect biota, appears unlikely due to the use of drilled pier construction and the high transmissivity of the aquifer. Surface drainage could be altered by construction of the rail spur, but the magnitude and significance of impact are expected to be low.

TRANSPORTATION AND OTHER SOCIAL SYSTEMS

During the peak construction period, the project will generate approximately 2,000 trips by personal vehicles and 100 truck trips (equivalent to 50 round trips). U.S. Highway 19, which is four-lane near the project site, will be the major public roadway receiving this additional traffic. Except for some minor slowdowns caused by turning at the access road during peak hours, the additional traffic should have minimal effect on highway conditions, given the large excess capacity that now exists. Deliveries of materials to the plant site by rail will involve traffic stoppages on Route 19 of less than two minutes per arrival or departure. Although the shipment schedule is unknown, the overall effect on traffic is expected to be of low significance.

The experience of previous construction projects at Crystal River indicates that the construction labor force for Units 4 and 5 is likely to be drawn from the following areas, in terms of distance from the site:

25 percent from within a 32 kilometer (20 mile) radius
25 percent from within the next 32 kilometers (20 miles)
25 percent from within the next 32 kilometers (20 miles)
25 percent from within the next 32 kilometers (20 miles)

Transient labor related to the project may place minor strains on the Citrus County community. One effect could be inflation in the price of rental housing. However, public facilities such as schools, hospitals, and water and sewer facilities appear adequate to serve the anticipated population influx. The construction of Crystal River Units 4 and 5 should have fewer adverse social effects than were produced by construction of Unit 3, since the scale of the local economy has increased and the construction activity will be more spread out over time. Given that the effects of Unit 3 were not serious, the social impacts of Units 4 and 5 should be of low significance. In particular, there should not be labor shortages during construction, or unemployment after the project. Substantial economic benefits will result from the wages paid to construction workers, which will exceed $75 million for the project as a whole, and the purchases of construction inputs from suppliers.

ARCHAEOLOGY

There are 20 known archaeological sites on the Florida Power Corporation property at Crystal River, all of which are shell middens ranging from possibly as early as 2000 B.C. to approximately 1000 A.D. These sites occur along the coastline and river banks of the northwestern and southwestern portions of the property. Many of the potential locations considered for facilities associated with Crystal River Units 4 and 5 would have affected one or more of these sites. However, the layout ultimately chosen will restrict all construction activity to inland areas where there are no known archaeological sites. The proposed project thus will have no impact on archaeological/historical resources.

COMMITMENTS OF RESOURCES

The commitments of land implied by the proposed project have already been discussed. These impacts are long-term, irreversible, and irretrievable. Another commitment that possibly could occur would be the dedication of an additional 61 hectares (150 acres) for ash storage, which would be necessary only if Florida Power is unsuccessful in efforts to market the ash.

Commitments of material during construction will include concrete, reinforcing and structural steel, and fill material. The majority of these materials will not be recoverable, but some will be suitable for recycling. Irretrievable energy commitments will include electricity, diesel fuel, and other fuel oils. Water will be needed during construction for hydrostatic testing of tanks, cleaning, drinking, and sanitary facilities (along with the use of retained stormwater runoff for soil compaction and fugitive dust control). Water for these purposes will be obtained from existing freshwater wells and/or a new well field. The commitment of water resources will be very minor, however, amounting to less than 150,000 liters (40,000 gallons) per day during the construction period.

OPERATIONAL IMPACTS

WATER RESOURCES

PROCESS WASTEWATERS

The process wastewaters from Crystal River Units 4 and 5 will include: low-volume wastes (cooling tower desilting wastes, sludge and backwash water from the service water pretreatment system, regenerate wastewaters from the demineralization and condensate polishing systems), cycle liquid losses, hydraulic sluice waters, sewage treatment plant effluent, cleaning and maintenance wastewaters, and cooling tower blowdown. The plant will be designed, however, so that the only wastewater released to surface water bodies in the vicinity of the site during normal weather conditions will be cooling tower blowdown. The other process wastewaters and rainfall runoff from the site will be routed respectively to the plant drains collection pond and the runoff collection and retention system. The plant drains collection pond is designed for zero discharge to surface water, relying on evaporation and exfiltration as well as a small flow to the ash disposal area for dust suppression. The runoff collection and retention system may, however, discharge to surface waters during rainfall events exceeding the 10-year, 24-hour storm. Of the total water input to the plant and storage areas excluding the cooling circuit, 13.6 percent ultimately will evaporate, 82.2 percent will exfiltrate, and 4.2 percent will represent moisture accumulation in the ash storage area.

Cooling system blowdown (NPDES 009 and 010) from Units 4 and 5 will be released to the existing discharge canal at a rate of 3,578 dm^3/s (56,727 gallons per minute) during peak operating conditions and 3,856 dm^3/s (61,142 gallons) per minute during normal operations. This water will be diluted by once-through cooling flow from Crystal River Units 1, 2, and 3, so that the blowdown from Units 4 and 5 will amount to only about 8 percent of the total flow in the canal on the average. The blowdown constituents having potential for ecological impact will be chlorine, organic phosphates, sulfuric acid, and thermal loading.

Shock chlorination of the cooling system will yield a total residual chlorine concentration in the blowdown which will not exceed 0.1 milligrams per liter at any one time, in compliance with the draft NPDES permit. Dechlorination facilities may be required. Instantaneous concentrations of total residual chlorine in the discharge canal at the edge of the 150-meter mixing zone are not expected to exceed the Florida Water Quality Standards criterion of 0.01 mg/1 of total residual chlorine. However, to assure that this degree of dilution can be achieved, Florida Power Corporation will be required to conduct dye dispersion studies prior to finalization of the Final EIS (FEIS). The use of an organic phosphate scale inhibitor will generate a phosphate residual in the blowdown of up to 10 parts per million. Periodic sulfuric acid treatment will be used for descaling. The required dosages and the resulting sulfuric acid concentrations in blowdown are unknown at present. The effects of these blowdown constituents on aquatic organisms are evaluated in the discussion of aquatic ecology.

Six operational scenarios for the existing and proposed power generating units at Crystal River have been evaluated in order to establish the worst-case thermal effects and other impacts of blowdown from Units 4 and 5. Cooling tower makeup and blowdown are expected to yield a net increase in thermal energy (and therefore in temperature) in the discharge canal in the coldest winter months. During the hottest summer months, however, cooling tower makeup and blowdown should lower the temperature in the discharge canal (effect a net decrease in thermal energy) for all but one scenario. For five of the six scenarios, discharge canal temperature should neither be increased by any more than 0.83°C (1.5°F) in winter nor decreased by more than 0.44°C (0.80°F) during summer. The remaining scenario [with increases of 5.8°C (10.5°F) in winter and 2.1°C (3.7°F) in summer] involves a permanent shutdown of

Units 1 and 2, and a temporary shutdown of Unit 3. The analysis thus indicates that the thermal impacts of Units 4 and 5 under steady state conditions will be insignificant for all but one scenario unless all existing units are inoperative. The design features (mitigative measures) responsible for achieving this result are the use of closed-cycle cooling, the reuse of cooling waters from Units 1, 2, and 3 as cooling tower make-up, and the withdrawal of blowdown from the cold side of the circulating water system.

STORMWATER OVERFLOW

The canal retention system is designed to retain a quantity of rainfall resulting from a 10-year, 24-hour storm. Stormwater runoff exceeding the design criteria (NPDES 011, 012, and 013) may cause the canal retention system to be discharged into the discharge canal by a drop inlet structure with a skimmer. This overflow would contain runoff from the coal and ash storage areas. Violations of water quality criteria or impacts on aquatic ecosystems are not expected, however, because of the short duration of overflows, the dilution of process wastewaters by rainwater (in a ratio of 50 to 1 or more), the treatment provided in the form of temporary detention storage, and the dilution of the ultimate effluent in the discharge canal.

LEACHATE

Groundwater resources, and possibly surface waters, could be affected by leachate from the ash storage area, coal piles, plant drains collection pond, and/or the canal retention system. The potential for leachate contamination will depend upon the precise characteristics of materials present and other factors such as soil absorption properties, soil transmissivities, and groundwater flow patterns. Studies of coal pile runoff/leachate suggest that there may be elevated concentrations of acidity, suspended solids, total dissolved solids, iron, manganese, and various trace metals. Fly ash, which will constitute a major proportion of material contained in the ash storage area, is known to be enriched in a variety of metals. Some of the leached metals from fly ash may form insoluble precipitates, however, and others may be adsorbed by soils and thus not widely distributed.

Although the nature and areal extent of leachate effects at the project site cannot be predicted accurately with present knowledge, some statements can be made. (Leachate generation and attenuation currently is being studied by Environmental Science and Engineering, Inc., in a Leachate Testing and Monitoring Program.) Leachates are expected to move west and south towards the Gulf of Mexico because of the natural flow pattern, but some movement in all directions around the storage areas may occur. Most outward movement is likely to take place at shallow depths (i.e., less than 15 meters [50 feet] below natural grade). The potential effects of leachate on vegetation are discussed in the terrestrial ecology section.

GROUNDWATER WITHDRAWAL

Florida Power Corporation proposes to obtain fresh water for Crystal River Units 4 and 5 from a well field about 8.2 kilometers (5 miles) east of the plant site. The five wells will be situated at approximately 150-meter (500-foot) intervals along an existing Florida Power Corporation easement. The wells will draw water from the Floridan Aquifer at an average rate of approximately 1,518 liters per minute (0.58 million gallons per day) and a maximum of 7,950 liters per minute (3 million gallons per day).

The cone of depression from pumping at the well field has been computed on the basis of available data in order to estimate the effect of groundwater withdrawal on the potentiometric surface of the upper Floridan Aquifer. The maximum estimated drawdown at the highest projected pumping rate is 0.76 meters (2.5 feet), which complies with the rules and regulations of the Southwest Florida Water Management District. Maximum drawdown at the property boundary of the FPC transmission corridor is expected to be approximately 0.53 meters (1.75 feet) at maximum pumpage. The cone of depression associated with normal usage of the well field would be substantially less pronounced, however, since the average pumping rate will be only one-fifth of the peak rate.

The proposed well field will have little effect upon overall groundwater availability in the area since the maximum pumping rate will equal only about 1 percent of the total flow to the Gulf of Mexico between Crystal River and the Withlacoochee River (Geraghty and Miller, 1977). Surface waters in the vicinity of the well field consist of karst-type depressions and scattered, small wet areas. The water surface in the area lakes and ponds is at approximately the same level as, or slightly above, the level of the Floridan Aquifer in the area. In the absence of clays or other low-permeability materials underlying these water bodies, their levels could respond to well field pumpage.

AIR QUALITY

The analysis of air quality impact has been conducted as part of the Prevention of Significant Deterioration (PSD) review process which is required for project approval. The proposed power generating units must comply with maximum allowable emission rates, Ambient Air Quality Standards, and PSD increments (representing maximum allowable changes in ambient concentrations relative to baseline conditions). In order to meet these requirements, the emissions of suspended particulate matter will be limited by the installation of a precipitator on each unit with 99.6 percent efficiency to collect fly ash. Nitrogen oxides will be controlled by the design and operation of the steam generator. The use of low sulfur coal (typical sulfur content 0.49 percent) will enable Crystal River Units 4 and 5 to meet state and federal emission regulations without sulfur dioxide removal devices. Tall stacks (183 meters [600 feet]) will facilitate pollutant dispersion.

The PSD analysis of impacts on ambient air quality has necessarily considered two geographic areas: the vicinity of the Crystal River site, designated a Class II air quality area; and the Chassahowitzka National Wilderness Area, which is located nearly 21 kilometers (13 miles) south of the site and is designated a Class I area. Because of the much smaller sulfur dioxide increments allowed at the Class I area (equaling 5 percent to 10 percent of the corresponding Class II increments), the

PSD analysis for the Chassahowitzka National Wilderness Area has determined the overall fuel strategy to be utilized by Florida Power Corporation at Crystal River. This strategy will involve limitations on the sulfur content of fuels burned in the existing Crystal River Units 1 and 2.

The Class II PSD analysis indicates only small changes in the annual average sulfur dioxide and suspended particulate matter concentrations near the plant site between 1974, the baseline year, and 1984 with both Units 4 and 5 in operation. The greatest utilization of a Class II increment is the maximum 3-hour sulfur dioxide increase of 198 ug/m^3 which amounts to 39 percent of the allowable increment. All other increases and concentrations are well below the designated limits. In the Class I analysis pertaining to the Chassahowitzka National Wilderness Area, the maximum 3-hour sulfur dioxide increase is 25 ug/m^3, which exactly equals the allowable increment. This low level of increase is not expected to have detrimental effects on the ecology of the wilderness area. The other air quality measures again are well below the allowable limits. The PSD analysis thus demonstrates compliance with state and federal air quality regulations.

An analysis of particulate matter deposition (dustfall) indicates that the maximum deposition rate under worst-case conditions will occur roughly 7 kilometers (4 miles) from the plant site, and will be less than 0.5 $mg/m^2/day$. Such a deposition rate would not have detectable impacts.

Coal handling and solid waste management activities are potential sources of particulate matter emissions in the form of fugitive dust. These sources are not expected to degrade air quality near the plant site, however, because of controls incorporated in the proposed facility design. Emissions from the transfer and processing of coal will be controlled by the use of wetting agents for open areas and bag filters for enclosed operations (conveyors, transfer points, silos, and crushers).

The use of sluices and pneumatic conveyance systems will minimize dust emissions from the handling of bottom and fly ash, and wetting agents will be applied during final disposal operations.

FOGGING

Cooling towers can cause fogging when water vapor emissions from a tower condense in the atmosphere. The maximum fogging potential exists when dense fog is not already present but the air requires little additional moisture to reach saturation. Modeling of meteorological conditions at the proposed plant site indicates that a potential for cooling tower induced fog exists approximately 344 hours a year. Because of prevailing winds during these periods, fog is most likely to occur in the southwestwern quadrant from the cooling towers, and thus its impact will be directed primarily toward the Gulf of Mexico.

Fogging associated with the proposed Crystal River Units 4 and 5 is unlikely to have significant negative impacts on air or highway transportation. When it occurs, fogging will be highly localized, extending no more than 1.5 kilometers (0.9 miles) from each cooling tower. The only highway that could be affected other than the Florida Power access roads would be U.S. Route 19-98, which is located more than 5 kilometers (3 miles) east of the proposed plant site. The fog plumes will not reach a sufficient height to affect aircraft. Fogging could possibly affect water navigation on the Florida Power intake canal, however. It is projected that hazards can be kept to minimal levels through the exercise of prudent vessel control during the infrequent periods when fogging occurs.

NOISE

The major noise sources associated with operation of the proposed generating facilities are the cooling towers, coal transfer and crushing operations, and turbine and boiler functions. The noise effects of the new facilities will represent increments relative to existing noise sources. The worst-case noise impacts of the new units have been computed on the assumption that a sound pressure level of 90 dBA will occur at a distance of 15.2 meters (50 feet) from the center of sound pressure at the project site. The impact at 6 kilometers (3.7 miles) from the site is estimated at 46 dBA, which is comparable to urban predawn background noise. There are presently only six occupied dwellings within this distance of the site, and little noise-sensitive development is expected in the future. For the areas closest to the site which might be expected to develop, the noise levels attributable to the proposed units would be eclipsed by traffic noise on U.S. 19-98. Thus, the noise effects of Units 4 and 5 are not considered a significant impact due to the lack of receptors near the plant site.

SOLID WASTE

The solid wastes produced during the operating life of Crystal River Units 4 and 5 will include dewatered bottom ash, pulverizer rejects, economizer ash, pretreatment system sludge, and precipitator fly ash. Florida Power Corporation will attempt to market fly ash for use as a paving material additive, a fill material, or some other use. Any material not marketed will be stored on-site in a designated land area of approximately 38 hectares (95 acres). The storage area will be developed in 8-hectare (20-acre) segments, each of which will be developed to a height of 12.2 meters (40 feet) above existing grade. An ash landfill will be designed and constructed based on the results of the leachate monitoring program discussed later in this document (see Monitoring Programs).

The artificial landform created should not detract from the aesthetic character of the area so long as the tree cover is maintained on land to the east. However, the ash storage will preclude many potential future uses of the land and will represent a long-term commitment of resources.

Solid wastes generated by the operation of Units 4 and 5 will include office wastes, trash, garbage, and scrap lumber and metal. Scrap lumber and metal will be recycled. Other wastes will be landfilled in approved areas near the new units, or disposed of by an outside contractor.

AQUATIC ECOLOGY

IMPINGEMENT AND ENTRAINMENT

The cooling water intake for Units 4 and 5 will be located on the north bank of the existing discharge canal. The 15-meter (50-foot) wide structure will consist of three cells, each having a traveling screen which passes over two horizontal axles. Screen backwash will be accomplished by pumps leading to high-pressure spray nozzles. The screens will be protected by barrier nets, floating booms, and/or trash racks. The intake pumps will create an intake water velocity of 0.04 to 0.15 meters per second (0.12 to 0.5 feet per second). Hydraulic studies indicate that the water entering the intake for Units 4 and 5 will consist primarily of flow that has passed through Unit 3, and will involve less than 10 percent of the cross-sectional area of the discharge canal.

Studies of impingement due to the operation of Units 1, 2, and 3 show that the impingement of aquatic organisms on intake screens is a function of habitat, area, season, time-of-day, tide, and other factors. Most common species were the polka-dot batfish, striped burrfish, blue crab, and squid (Snedaker, 1974). Slightly less than 8 percent of the impinged biomass was composed of species of economic importance. The NUS study was conducted in 1977 and 1978, at which time 106 species of finfish and 45 species of invertebrates were collected. Eleven species of finfish accounted for 94 percent of the total number of fish individuals captured. Table 9-5.17 presents ranking (highest to lowest) of species of biomass collected during the two impingement studies conducted at Crystal River. NUS estimated that impingement at all three existing units amounted to about 0.5 percent of the number of blue crabs taken commercially in the Citrus-Pasco County area in 1976. Impingement of pink shrimp was estimated to be about 1 percent of the number caught commercially in the Citrus-Pasco County area. Limited information is currently available concerning the fishes and other nekton found in the discharge canal near the site for the new intake structure. The species composition of fishes appears to be less "rich" than in the existing intake canal, with a predominance of larger, schooling forms such as mullet, pinfish, spotted seatrout, Atlantic croaker, red drum, spot, and silver perch. The discharge canal constitutes a physical "dead-end" for upstream swimmers. Fishes are attracted to the warm water of the canal in winter but appear to engage in little feeding activity there.

Impingement is expected to be much less for Units 4 and 5 than for the existing units because of the lower intake velocity and volume involved, and because the seaward current in the discharge canal will tend to limit the available species to the larger, faster-swimming fishes that can escape entrapment.

The entrainment of plankton populations (i.e., organisms that are small enough to pass through intake screens) can involve several types of impacts: (1) loss of biological production; (2) alteration of the trophic structure of the biological community; and (3) losses of commercially important species that spend part of their life cycle as members of the plankton community. Studies of entrainment at Crystal River Units 1, 2, and 3 and at other power plants suggest that elevated temperatures may be more important than mechanical damage in producing zooplankton mortality, whereas the reverse may be true for young/small fish. Regarding temperature effects, the rate of change in temperature may be more significant to survival than the amplitude.

The zooplankton individuals inhabiting the discharge canal will have already been subjected to a rapid temperature change of as much as 8°C. It is anticipated that near 100 percent mortality will occur among the individuals that are entrained by Units 4 and 5 and subjected to additional temperature stress (plus the effects of increased salinity and biocide use in the towers). One hundred percent mortality is also expected to occur for all fishes of unscreenable size that enter the Unit 4 and 5 intakes.

The overall entrainment impacts of Units 4 and 5 are not considered significant because of the mortality that will have already occurred in

Units 1, 2, and 3, and because of the relatively small intake volume for Units 4 and 5.

EPA has determined tentatively that the location, design, construction, and capacity of the proposed cooling water intake structure reflects the best technology available for minimizing adverse environmental impacts in accordance with Section 316(b) of the Clean Water Act. This topic is discussed more fully in Chapter VII, Page VII-5, of the DEIS.

WASTEWATER DISCHARGES

As described earlier, cooling tower blowdown will be the only wastewater discharged to surface waters at the proposed plant site other than very infrequent overflows from the canal retention system. The total residual chlorine concentration in blowdown discharge will be limited to 0.1 mg/l to assure compliance with Florida Water Quality Standards requirements. Although low chlorine concentrations can produce adverse effects on phytoplankton, it is expected to be low in both magnitude and significance. The phosphate residual and periodic sulfuric acid content of the blowdown are likewise expected to have negligible impact on aquatic ecosystems. An important factor in all cases is the very high degree of dilution received in the discharge canal.

BARGE TRANSPORTATION

The Florida manatee, a protected species, is thought to frequent the Withlacoochee and Crystal rivers. An attraction of Crystal River for this aquatic mammal is the warm water (relative to the Gulf in winter) emanating from springs. Fewer than 25 sightings of manatees in or near the Florida Power Corporation canals have been recorded by the U.S. Fish and Wildlife Service in the past three years (Irvin, 1977, personal communication). The only possibility of impact on the manatee population by Crystal River Units 4 and 5 would be the increased risk of injury to these animals by barge traffic in the intake canal or adjacent waters. This risk is considered low because of the relative infrequency of barge movements (roughly one arrival or departure per day) and the fact that the principal attraction of the plant area for manatees would be the heated discharge canal rather than the intake canal.

TERRESTRIAL ECOLOGY

The effects of site development on terrestrial ecosystems have been discussed in the section dealing with construction impacts. The additional types of impact to be considered involve leachate from the coal piles and ash storage area, salt drift from the cooling towers, groundwater withdrawals at the well field, transmission corridor maintenance, and miscellaneous aspects of plant operations.

LEACHATE

As described earlier, leachate movement through the ground water is likely as a result of exfiltration from storage areas and other facilities. The depth and areal extent of leachate contamination are uncertain. Some impacts on vegetation near the storage areas may occur if pollutants such as heavy metals reach the root zone. There could be reductions in plant growth, community productivity, and detrital production. If concentrations reach toxic levels, there might be an elimination of various floral components of the community, and a situation in which new seedlings could not become established. However, this eventuality is considered unlikely to occur over a large area, since leachate concentrations will decrease with distance and diluted by groundwater flow.

Heavy metals could pass into faunal organisms through ingestion of detritus or vegetation. Accumulation could occur at the higher trophic levels, although this effect would be insignificant for organisms with wide feeding ranges. Overall, the ecological impacts of leachate should have low significance because of the limited area of leachate interaction with surface conditions. Leachate generation and attenuation will be studied by Environmental Science and Engineering, Inc., in a comprehensive Leachate Testing and Monitoring Program. Monitoring of ground water to assure that significant damage does not occur is required in the NPDES permit.

SALT DRIFT

Salt drift from cooling towers that are fed by saline water involves the escape of drift droplets that contain roughly the same concentrations of chemicals as found in the circulating water. The drift is deposited in the form of droplets or solid particles, and leaves chemical precipitants on surfaces downwind from the tower. Salt drift from the proposed cooling towers should have minimal influence on off-site land uses because of the isolation of the site, but nearby vegetation could be affected. Based on mathematical modeling, the maximum salt deposition expected is 10.6 kilograms per hectare per month (114 pounds per acre per year), occurring at a point 0.3 kilometers (0.2 miles) west of the cooling towers. Salt deposition will exceed 2.6 kilograms per hectare per month (28.1 pounds per acre per year) on a total of approximately 200 hectares (500 acres) of land, but will become minor at distances greater than 1.3 kilometers (0.8 miles) from the towers. These deposition rates will be in addition to a background salt deposition level of 2.8 kilograms per acre per month (30 pounds per acre per year) attributable to the ocean's influence as an area source of salt. The most extensive study of vegetative response to salt drift identified only one species (dogwood) that was highly sensitive to drift conditions (Curtis, et al., 1976). Injuries occurred in about 5 percent to 40 percent of the leaves at a deposition rate of 20 kilograms per hectare per month (216 pounds per acre per year). The threshold leaf injury level was placed at 7.46 kilograms per hectare per month (80.6 pounds per acre per year) (Curtis, et al., 1978). Florida Power Corporation will conduct monitoring of salt drift to determine impacts.

There may be some possibility of injury to sensitive plant species at the Crystal River site due to salt drift, but widespread damage is unlikely. The experience of the two existing power plants in the U.S. with salt water cooling towers suggest that the significance of this impact will be low; however, monitoring of impacts of drift will be required by the NPDES permit.

GROUNDWATER WITHDRAWAL

Drawdown of the water table as a result of withdrawals at the proposed Florida Power Corporation well field could affect those biological communities associated with freshwater marshes. Present aquifer characteristics indicate a separation of water table and water source aquifers. However, changes such as transition from permanent marshes (pickerelweed, waterlily) to seasonally flooded marshes (smartweed, arrowhead, sawgrass) to wet prairies may occur where the water table drops below ground surface temporarily due to water withdrawal. The consequence would be changes in species composition, productivity, food web relations, wildlife habitat, and possibly habitat for rare and endangered plants (e.g. sundews). Minor effects on wildlife could result from a reduction in seasonal wetlands. If the character of the marshes and ponds is changed, a shift from aquatic species (turtle, pig frog) to prairie forms (cranes, rails) will occur. The significance of such changes will depend upon the area of wetland affected, which is presently uncertain. It appears likely that long-term changes such as those just described will be limited in extent and therefore low in overall significance because the drawdowns are predicted to be relatively small.

POWER TRANSMISSION

The existing transmission lines serving Crystal River Units 1, 2, and 3 at the site will be adequate to transmit the power generated by Units 4 and 5. The only additions necessary will be the interconnects from Units 4 and 5 to the existing site substation. Since the interconnecting lines will cross only areas that are to be filled and graded for site development, no additional impacts upon vegetation or wildlife are expected. Vegetation below power lines will be maintained by mechanical trimming to the extent necessary for access, and will not be controlled by the use of herbicides. Ozone generated by the power lines will not occur in sufficient ground-level concentrations to affect vegetation.

MISCELLANEOUS EFFECTS

The operation of Crystal River Units 4 and 5 will involve an increase in "road-kills" of some wildlife species due to traffic on the access road. The effect on wildlife populations should be negligible, however. Air quality controls will prevent any damage to vegetation as a result of pollutant emissions at the site. The noise generated by power plant operation may cause some noise-sensitive wildlife species to avoid the area, thus reducing the range of these animals. This impact is considered low in significance due to the abundance of similar habitat elsewhere.

SOCIAL AND ECONOMIC IMPACTS

The operation of Crystal River Units 4 and 5 will yield substantial economic benefits to Citrus County. The operation and maintenance of Unit 4 will create 112 jobs with a payroll of $3,024,000 per year, and the start-up of Unit 5 will add 20 additional jobs and $420,000 in payroll. Starting in 1985, approximately $300,000 will be spent per year on contract labor and specialized labor services. Florida Power Corporation intends to utilize the local labor market to the maximum extent possible. Property tax payments to the Citrus County government will amount to approximately $2,900,000 per year for Unit 4 and $2,280,000 for Unit 5. These figures are averages for the first five years of operation beginning in 1983 and 1985, respectively.

The proposed power generating units are compatible with existing land use patterns in the area. Virtually all land within 4.8 kilometers (3 miles), and most land within 6.4 kilometers (4 miles), is zoned for mining and industrial use. At present there are only six occupied dwelling units within 6.4 kilometers (4 miles) of the site. Although very rapid population growth is expected to continue in Citrus County, there is ample room for development elsewhere, so that land use conflicts involving the Florida Power facilities are not expected.

The proposed facilities will have a minor impact on transportation, in that traffic on U.S. Route 19-98 will be stopped to permit the arrival and departure of approximately one unit train per day. Each stoppage will require less than 2 minutes. Approximately three barges will arrive at the plant site per week to deliver coal for Units 4 and 5, which should have no impact on existing transportation facilities. The scenery of the site area will be altered slightly by the addition of the proposed power generating units, stacks, and cooling towers, which will be visible from some points on U.S. 19-98. Whether the group of four stacks will represent a greater visual impact than the two existing stacks is a subjective matter.

The proposed project will not affect existing recreational or cultural facilities. The site area to be developed is without notable scenic, recreational, historic, or cultural value. The lack of value for recreation is related to the absence of attractive beaches or convenient water access. The nearest cultural facility is the Crystal River Archaeological Site, which is located approximately 8 kilometers (5 miles) southeast of the power plant complex and which should not be affected by the two additional units. The proposed project should have no significant impacts on commercial or recreational fishing in the Gulf of Mexico.

COMMITMENTS OF RESOURCES

The most important commitments of natural resources involved in the operation of the proposed power generating units will be fuel consumption, water consumption, land alteration, leaching of pollutants into groundwaters, and utilization of air quality increments. Coal transported from the eastern and western United States for use in Units 4 and 5 will average approximately 3.4 million metric tons (3.74 millon tons) per year over the 30-year projected life of the facilities. Maximum fuel-oil usage for furnace warm-up and coal ignition will be 10.6 million liters (2.8 million gallons) per year for each unit. Fuels will also be burned elsewhere to provide energy for transportation and manufacturing activities required by the project.

The proposed facilities will consume fresh water at an average rate of approximately 1,518 liters per minute (401 gallons per minute, or 0.58 million gallons per day). An important design change in the project has been the substitution of saltwater cooling towers for fresh-water cooling, which has reduced demands for fresh water by more than 90 percent. The annual water usage will be less than one-fifth of the well field capacity, and will amount to less than 1 percent of the annual groundwater flow to the Gulf between the Withlacoochee and Crystal rivers.

The use of land for ash storage may represent a substantial permanent commitment of land resources if Florida Power Corporation is unable to market most of the ash produced. The utilization of air quality increments represents a long-term but reversible commitment of air assimilative capacity. It is very unlikely that this commitment will constrain future economic development in Citrus County.

CHAPTER VII
MITIGATIVE MEASURES
CONSTRUCTION

AIR

Modern methods of dust control and dust emission prevention will mitigate the effects of construction in the vicinity of the proposed site. Air quality control rules of the State of Florida for fugitive dust emissions and open burning will also be met (Florida Department of Environmental Regulation, Ch. 17-2.04 (3) F.A.C.; and Florida Division of Forestry, Ch. 51-2 F.A.C.).

To achieve full compliance with these regulations, the following mitigative controls will be implemented during construction:

1. All reasonable precautions will be taken to prevent fugitive dust emissions. Such precautions will include using, where practicable, asphalt or oil, water or dust-suppression chemicals for the control of dust from grading and clearing operations and on dirt roads.
2. Open burning of land clearing debris will comply with these conditions:
   a. Burning will be performed between 9:00 a.m. Eastern Standard Time (EST) and one hour before sunset; at other times, a forced-draft system will be used.
   b. The burning location will be at least 45 meters (50 yards) from the nearest occupied building or public highway.
   c. Piles will be no larger than can be burned within the designated time.
   d. Moisture content and composition will be favorable for good burning.
   e. Smoke emissions will not exceed 40 percent opacity or Number 2 on the Ringelmann chart, except during startup.

WATER

There will be no point source discharges to surface waters due to construction runoff. To eliminate construction runoff and siltation in nearby surface waters, detention ponds will be constructed as necessary. Cleared and filled areas will be diked, as practicable, to eliminate potential discharges. Surface water runoff will be collected and utilized for dust suppression. Sanitary waste disposed of on site will receive secondary treatment and will be discharged to an evaporation/percolation pond.

The sewage treatment plant will be of a size to adequately handle peak loads produced during the construction phase.

LAND

The selection of the Crystal River site presents several environmental advantages. These include:

1. Potential impacts and commitments of resources attributable to the construction of new transmission lines will be avoided by utilizing the existing transmission corridor at the selected site. Typical corridors require about 5 hectares (12 acres) of land per mile of transmission line.
2. Existing navigable canals at the selected site will accommodate future coal deliveries, thereby minimizing potential dredging impacts, particularly on aquatic and terrestrial ecosystems.
3. The proximity of the proposed units to other facilities operated by Florida Power presents an advantageous flexibility in air pollution control strategies. This situation is even more important since Florida Power will control the majority of emission sources in the vicinity.

Florida Power has chosen to arrange the new facilities on the site in such a way as to minimize environmental impacts. Proposed facilities have been designed to avoid displacing wetlands and valuable habitats such as the salt marsh and coastal hydric hammocks. Other layouts of the facility were feasible, but Florida Power selected a plan which would minimize impacts to more sensitive ecological systems. Also, in the proposed arrangement, the facilities are farther removed from areas of archeological site concentration than in other site plans which were considered.

Waste materials, such as scrap lumber and metal, will be recycled during and after the construction project. Such materials will be stockpiled in areas where salvage operations can transport them off the site. Other solid wastes will be landfilled in the area.

OPERATIONAL

AIR

Burning low-sulfur coals will result in less degradation of air quality than burning high-sulfur coals. Scrubbers are not necessary when using low-sulfur coals, and therefore are not planned for Units 4 and 5. Without the use of scrubbers, stack emissions are hotter and the potential dispersion of air pollutants is greater. Also the potential volume of solid wastes from the facility will be reduced by eliminating scrubber sludge. A detailed description of air emission control alternatives is presented in Section 9.6 of Chapter 9 (Technical Support Documents).

The use of scrubbers results in a reduction of the electrical generation which can take place for a given amount of fuel. If other control technology is used, this lost fuel would be made available for other uses. Consequently, the improved fuel efficiency of the newer units allows more electricity to be produced with fewer air emissions for a given amount of fuel.

Oxides of nitrogen will be controlled by design and operation of the steam generator. Particulate matter generated during combustion will be removed by the electrostatic precipitator designed to be 99.6 percent efficient in this task.

Dust emissions from coal and ash handling will be controlled by either application of wetting agent or bag filter units.

WATER

Florida Power's plans to use closed-cycle cooling represent a reduction in the potential for impacts of thermal addition to the nearby estuary which could result from once-through cooling. In addition, the use of natural draft cooling towers will produce less noise, less drift, and consume less fuel than mechanical draft towers.

The proposed location of cooling water intake for the facility is adjacent to the existing discharge canal serving Crystal River Units 1, 2, and 3. Since the water at the point of intake has been discharged by the other units, this plan actually represents the reuse of wastewater and eliminates the commitment of additional natural waters for cooling purposes on the site.

A small amount of dredging will be necessary for the construction of a saltwater makeup intake structure and a discharge structure. The amount of material dredged from the discharge canal will be less than 160 cubic yards. All dredging will take place during a period of one month. In compliance with state licensing, construction of intake and discharges must be done in a manner to minimize turbidity. Sheetpile or turbidity screens must be used if necessary to prevent turbidity in excess of 50 Jackson Turbidity Units (JTU) above background beyond 150 meters from the point of discharge and/or construction site. The activity will result in impacts to the benthic community in a small area and a short period of increased turbidity.

Several design and capacity aspects of using this water source will minimize the potential biological impacts due to impingement and entrainment. First, the intake water velocity of 0.04 to 0.15 meter per second (0.12 to 0.5 foot per second) complies with current EPA intake velocity design criteria. Also, the intake flow rate for normal operation represents only approximately five percent of the total flow rate in the discharge canal. Barrier nets, floating brooms, and/or trash racks will be located immediately in front of each intake traveling screen to deflect various debris, including the larger organisms. Probably the most important aspects of this plan for minimizing biological impacts are that the water has previously been used in the cooling systems of Units 1, 2, and 3 and that the discharge canal at the intake structure location and above is a relative barren biological or feeding area. Most susceptible organisms in the intake area have already been killed by the thermal and mechanical impacts of Units 1, 2, and 3, or would generally be larger, faster-swimming species of fishes which could avoid impingement. As a consequence, the quantity of living fishes and other organisms available for impingement or entrainment is much less than would normally be available for such a surface water intake system or as currently occurs for Units 1, 2, and 3 intakes.

Due to the location (on existing discharge canal), design (flush-mounted with canal wall, low intake velocity), capacity (cooling towers minimize usage), and construction plans (minimal dredged volume over a short time period with control of turbidity) of the intake system, EPA has tentatively determined that the proposed cooling water intake structure reflects the best technology available for minimizing adverse environmental impacts in accordance with Section 316(b) of the Clean Water Act.

The wastes handling system of the facility is designed to reclaim and recycle water in a number of ways. Waters used to transport solid wastes are reclaimed and reused in a dewatering process.

Wastewater streams which contain chemicals from cleaning or other processes are treated in a neutralization basin. Diking systems are proposed to prevent spills of oil from being released into surface waters.

Barge traffic associated with transport of coal will traverse waters known to be within the range of the Florida manatee, an endangered species. The U.S. Fish and Wildlife Service's (USFWS) biological opinion states that project activities would likely jeopardize the continued existence of the manatee. The draft NPDES permit, Part III Conditions (Appendix A) requires implementation of guidelines prepared by USFWS to mitigate adverse impacts to the manatee.

LAND

Terrestrial impacts are mitigated by the selection of the proposed site and are largely completed in the construction phase of the project. Proposed methods of liquid and solid waste management during the operation of the plant will, however, help contain or prevent soil contamination by plant wastes. Impervious areas surrounding oil containers limit soil as well as water contamination.

Selection of saltwater as the cooling medium vastly reduces the consumption of fresh water from nearby surface or ground sources and thereby reduces associated impacts.

Salt drift originating from the natural draft cooling towers may impact the surrounding vegetation. Widespread damage is unlikely; however, a monitoring program to assess the impacts of salt drift will be summarized in the Final EIS and the program will be initiated prior to plant operation. The salt drift monitoring program is required as a Part III Condition to the draft NPDES permit (Appendix A). Mitigative measures acceptable to EPA are required if significant impacts occur.

GROUND WATER

Leachate from the ash disposal area, plant drains collection pond, and coal piles may enter the groundwater regime. A groundwater monitoring program designed to assess whether such leachate is significantly contaminating the groundwater will be implemented prior to operation of Units 4 and 5. The draft NPDES permit, Part III Conditions (Appendix A) requires the institution of such a program and of mitigative measures acceptable to EPA if significant groundwater contamination occurs. Additional ash disposal areas may be required during the life of Units 4 and 5. If additional area is required or if coal storage areas must be expanded or relocated, potential impacts to the terrestrial and groundwater regimes may be expected. The draft NPDES permit, Part III Conditions (Appendix A) requires that an assessment of the environmental impacts be made prior to any relocation or expansion.

To mitigate potentially significant contamination of the groundwater regime, the draft NPDES permit, Part III Conditions requires that all coal piles containing coal with a pyritic sulfur content greater than 0.2 percent be lined.

MONITORING PROGRAMS

AIR

During site preparation and facility construction, the significant air emissions will be fugitive dust from land clearing and grading and smoke from burning of the land-clearing wastes. Both of these emissions are classified as particulate matter and can be measured by the Federal Reference Method (FRM) High-Volume samplers (40 CFR Part 50).

Once Units 4 and 5 are operating, the significant air emissions to be monitored will be the particulate matter and sulfur dioxide from the combustion of coal in the two coal-fired steam-generators. In addition to the FRM High-Volume sampling technique for sampling particulate matter, a FRM sulfur dioxide reference method and equivalent methods for sulfur dioxide have been promulgated. Both methods can be utilized to measure the air emissions during plant operations.

Three sampling stations are proposed as the construction and operation air monitoring network. These stations are the same as three of the baseline monitoring programs. Each station will measure ambient concentrations of total suspended particulate matter and sulfur dioxide (sulfur dioxide monitoring will be required only during operation). A minimum sampling will be scheduled once every sixth day, and monitoring will continue for the life of the units.

The meteorological monitoring data available from the existing meteorological station will continue to be used by Florida Power.

WASTEWATER

The water quality monitoring program will consist of sampling at the following five potential discharge sources during plant operation:

#009 and 010	Cooling Tower Blowdown, Units 4 and 5, respectively.
#011	Coal Storage Area
#012	Ash Disposal Area
#013	General Plant Runoff

All sampling and analytical procedures will be those contained in 40 CFR 136. Locations of the discharges are as shown in Figure 30. Monitoring frequency is presented in Table 48.

GROUND WATER

Groundwater monitoring is incorporated into a leachate monitoring and testing program designed to comply with requirements of the FDER Special Conditions of Certification, as revised in September 1978, and the requirements of the U.S. EPA Environmental Impact Statement and draft NPDES permit for Crystal River Units 4 and 5. Although it is specifically concerned with leachate from the Units 4 and 5 ash landfill, the program will effectively monitor shallow ground water throughout the project site. The program, to be conducted by Environmental Science and Engineering, Inc., consists of the following major phases:

Phase I—Baseline Monitoring, Groundwater Quality and Hydraulics
Phase II—Leachate Formation and Control, and Attenuation Testing
Phase III—Zone-of-Discharge Analysis
Phase IV—Evaluation of Performance of Demonstration Landfill Cells
Phase V—Geophysical Survey and Mapping of Solution Cavities
Phase VI—Design and Construction of Ash Landfill

PHASE I: BASELINE MONITORING

This phase includes a year-long water quality study with provisions for subsequent annual sampling, as well as an analysis of aquifer hydraulics.

A network of 17 observation wells, 14 shallow and 3 deep, has been constructed onsite as shown in Figure 31. Table 49 provides well

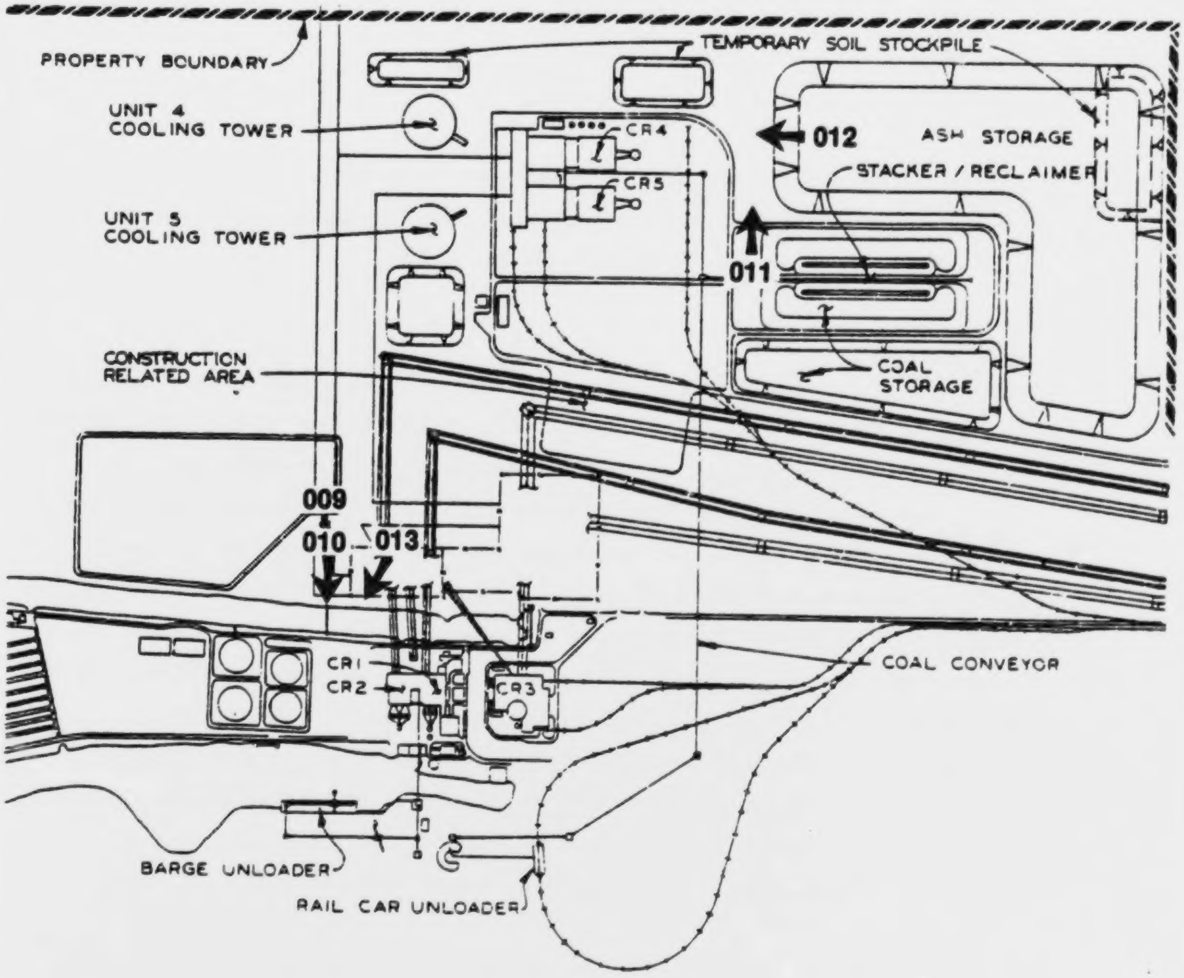

PROPERTY BOUNDARY
TEMPORARY SOIL STOCKPILE
UNIT 4
COOLING TOWER
CR4
012
ASH STORAGE
STACKER / RECLAIMER
CR5
UNIT 5
COOLING TOWER
011
CONSTRUCTION
RELATED AREA
COAL
STORAGE
009
&
010
013
COAL CONVEYOR
CR1
CR2
CR3
BARGE UNLOADER
RAIL CAR UNLOADER

Figure 30
EFFLUENT SAMPLING LOCATIONS.

N

0 1000 2000
SCALE IN FEET

SOURCE: BLACK AND VEATCH, 1980.

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

FPCR4/5-RSUM.4/RVTB48.1
6/2/80

Table 48. Groundwater Quality Parameters

Key Water Quality Indicators (Monthly)

- Specific Conductivity*
- Color
- Turbidity
- Chloride
- Sulfate
- Dissolved Organic Carbon
- Total Dissolved Solids
- Total Suspended Solids
- Iron
- Nickel
- Selenium
- Chromium
- Arsenic
- Beryllium
- Mercury
- Lead

Monitored During Aquifer Analysis

- pH
- Redox Potential
- Specific Conductivity*
- Dissolved Oxygen
- Temperature

Extended Water Quality Indicators (Quarterly)

The key indicators listed above plus:

- Aluminum
- Barium
- Calcium
- Magnesium
- Sodium
- Cobalt
- Gross Alpha†
- Vanadium
- Molybdenum

---

*Monitored in all wells during aquifer analysis; monthly water quality program monitors specific conductivity in only four wells.

†If Gross Alpha $\geq$ 15 pic/l, the following elements will be analyzed:
Radium 226
Uranium
Thorium

Source: Environmental Science and Engineering, Inc., 1980.

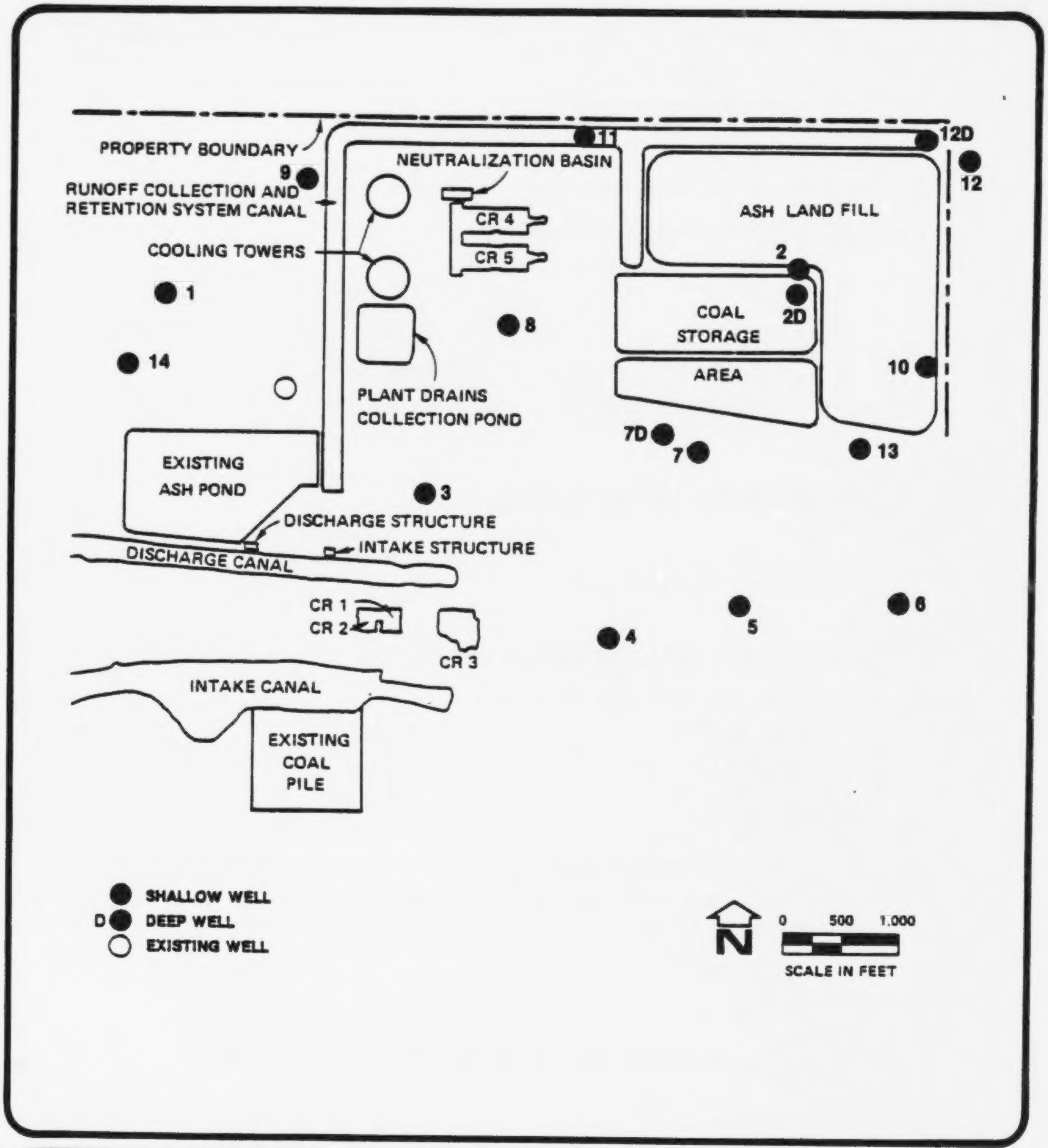

PROPERTY BOUNDARY
9
RUNOFF COLLECTION AND
RETENTION SYSTEM CANAL
NEUTRALIZATION BASIN
11
12D
12
CR 4
CR 5
COOLING TOWERS
ASH LAND FILL
2
2D
COAL
STORAGE
AREA
1
8
14
10
PLANT DRAINS
COLLECTION POND
7D
7
13
EXISTING
ASH POND
3
DISCHARGE STRUCTURE
INTAKE STRUCTURE
DISCHARGE CANAL
CR 1
CR 2
CR 3
4
5
6
INTAKE CANAL
EXISTING
COAL
PILE
SHALLOW WELL
D DEEP WELL
EXISTING WELL
N
0 500 1,000
SCALE IN FEET

Figure 31

LOCATION OF OBSERVATION WELLS FOR LEACHATE MONITORING PROGRAM FOR CRYSTAL RIVER UNITS 4 AND 5.

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1980.

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

FPCR4/5-RSUM.4/RVTB49.1
6/2/80

Table 49. Construction Details of Observation Wells for Leachate Monitoring Program for Crystal River Units 4 and 5

Well Number*	Well Diameter	Well Depth	Casing Depth
OW-1	2"	20'	18.5'
OW-2	4"	20'	18.5'
OW-2D	2"	58'	53.8'
OW-3	4"	20'	18.5'
OW-4	2"	23'	23.0'
OW-5	2"	20'	18.5'
OW-6	2"	20'	18.5'
OW-7	4"	20'	18.5'
OW-7D	4 1/2"†	45'	42.4'
OW-8	2'	20'	18.5'
OW-9	2"	20'	18.5'
OW-10	2"	20'	18.5'
OW-11	2"	20'	18.5'
OW-12	4"	20'	18.5'
OW-12D	2"	53'	47.3'
OW-13	2"	20'	18.5'
OW-14	2"	20'	18.5'
OW-15	4"	20'	18.5'

*See Figure 31 for location.
†Upper 17.4' of hole has 4" casing; 2" casing from 17.4' to bottom of hole.

Source: Environmental Science and Engineering, Inc., 1980.

construction data. The wells are located both upgradient and downgradient of the ash disposal area, new coal storage area, plant drains collection pond, and runoff retention system.

Key water quality parameters will be monitored monthly and extended water quality parameters will be monitored quarterly as indicated in Table 50. Wells 7, 7D, 12, and 12D will be sampled in the water quality study.

Hydraulic aquifer analysis will be based on wet and dry season monitoring of observation wells for water level and specific conductivity, and on tide data, barometric pressure, pan evaporation, and rainfall. Data will be used to construct water table elevation maps, to assess hydraulic homogeneity in the shallow aquifer, to determine the degree of tidal coupling between the aquifer and the Gulf of Mexico, and to establish aquifer response to rainfall.

PHASE II: LEACHATE TESTING

This phase will consist of the following five related efforts:

Ash shake tests will generate a synthetic leachate from ash representative of that to be produced at Units 4 and 5. Actual leachate characteristics may be predicted using the synthetic leachate.

Soils testing will utilize limestone fill base and subsoil from the ash landfill site to establish baseline metals concentrations and to determine the ability of the subsoil to remove metals from leachate.

Clay testing will be performed on locally available clays to determine their suitability for use as liners for the ash landfill.

Permeability and compaction testing of ash, subsoil, and clay potentially suitable as liners will be analyzed to establish the compaction and mixtures necessary for suitable permeabilities.

Table 50. Effluent Monitoring Programs

Potential Discharge	Frequency of Monitoring					
	Continuous	Once Per Day	Once Per Week	Once Per Month	Once Per Year	Other
Cooling Tower Blowdown	Flow temp.	pH	Cl (free and total) Phosphorus as P			
Ash Disposal Area			TSS, Oil and Grease	Heavy Metals,* As		Flow once per week during discharge
Coal Storage Areas			TSS	Heavy Metals,* As		Flow once per week during discharge
Canal Retention System		pH				Flow once per day during discharge; TSS twice per week

*Includes cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. Monitored once per month during discharge; otherwise, at end of the 3-month sampling period.

Source: Environmental Science and Engineering, Inc., 1980.

Column leaching tests will assess leachate attenuation through columns of potential liner materials.

PHASE III: ZONE OF DISCHARGE ANALYSIS

The results of Phase I and Phase II will be analyzed in this phase through groundwater quality modeling in order to simulate leachate transport through the aquifer zone of discharge.

PHASE IV: DEMONSTRATION CELLS

One or more test cells designed to minimize leachate production will be constructed at the ash landfill site, using representative ash. Seepage through the cell will be monitored in adjacent wells constructed especially for this purpose.

PHASE V: GEOPHYSICAL SURVEY

Resistivity analysis will provide information on the presence of solution cavities within the landfill.

PHASE VI: DESIGN AND CONSTRUCTION OF LANDFILL

Preceding phases having provided the site- and material-specific information necessary, an ash landfill will be designed and constructed which will enable adequate leachate attenuation.

ARCHAEOLOGY

During construction activities, normal archaeological monitoring and safeguards will be followed to protect possible discoveries. The state historic preservation officer will be notified if a potential historical site or find is discovered. Work will be stopped in the immediate area and will not be resumed until the approval of the Florida Division of Archives, History, and Records Management is received.

LIST OF PREPARERS

U.S. Environmental Protection Agency

John E. Hagan III	Chief, EIS Branch
Robert B. Howard	Chief, EIS Preparation Section
John P. Herrmann	Project Officer (1977-1979)
Clara J. DeLay	Project Officer (1979-3/1980)
Dario J. Dal Santo	Project Officer (3/1980-Publication)
Charles H. Kaplan	NPDES Permit
Thomas A. Gibbs	Chief, Air Facilities Branch
Edward T. Heinen	Chief, Ecological Review Branch
John T. Marlar	Chief, Water Quality Management Branch
James H. Scarbrough	Chief, Residuals Management Branch
Leonidas B. Tebo, Jr.	Chief, Ecology Branch
Donald J. Guinyard	Chief, Groundwater Section

Environmental Science and Engineering, Inc.

E.R. Henderson, Ph.D., P.E.	Project Director
Kennard F. Kosky, M.S.E., P.E.	Project Manager, Mechanical Engineering
Frank L. Hearne, M.S.	Asst. Project Manager, Aquatic Ecology
Steven R. Marks, M.S., C.C.M.	Meteorology, Air Quality
Marvin K. Hamlin, M.S.	Air Quality Monitoring
Alberto Linnero, M.E.	Noise Impacts
Steven W. Fletcher, Ph.D.	Terrestrial Ecology

Roy S. DeLotelle, M.S.	Terrestrial Ecology
Mel E. Lehman, M.S.	Systems Ecology
Clay A. Adams, M.S.	Aquatic Ecology
Bill Marsh, M.S.	Aquatic Ecology
James B. Holly, M.S.	Groundwater Hydrology--Geology
Herbert C. Stangland, M.S., P.E.	Groundwater Hydrology--Geology
David E. Bruderly, M.S., P.E.	Surface Water Hydrology, Civil Engineering
Allen P. Hubbard, B.S.E.	Surface Water Hydrology, Civil Engineering
Thomas Hammer, Ph.D.	Socioeconomics
Jack D. Doolittle, B.A.	Socioeconomics
Marcia L. Ward	Archaeology, Socioeconomics
Marcia W. Willis (Consultant)	Archaeology
Charlotte M. Sykes, B.A.	Document Coordination
Ginger Windham	Document Coordination
John Milko (RS&H)	Electrical Engineering (Need for Power)
Jackson B. Sosebee, M.S.	Water Chemistry
Greg M. Powell, M.S.	Surface Water Hydrology

Appendix A
NPDES Permit, Units 4 and 5

DRAFT 8/28/80

Permit No. FL0036366

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

is authorized to discharge from a facility located at

Crystal River Power Plant
Units 4 and 5
Citrus County, Florida

to receiving waters named Gulf of Mexico
from discharge points enumerated herein, as serial numbers 009, 010, 011, 012 and 013.

during the effective period of this permit

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight, Permittee shall not discharge after the above date of expiration without prior authorization. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information, forms, and fees as are required by the Agency authorized to issue NPDES permits no later than 180 days prior to the above date of expiration.

Signed this day of

Sanford W. Harvey, Jr., Director
Enforcement Division

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 009 and 010 - Cooling tower blowdown from Units 4 and 5, respectively.

Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Daily Average	Two-hour Average	Measurement Frequency	Sample Type
Flow-m³/Day (MGD)	N/A	N/A	Continuous	Recorder (totalizer)
Temperature °C(°F)	N/A	35.6(96.0)	Continuous	Recorder
Chlorine Residuals (Free & Total) mg/l	See Below		1/week 1/	Multiple Grabs
Phosphorus (mg/l as P)	N/A	10.0	1/week 2/	Grab
Calcium (mg/l)	N/A	N/A	1/week	Grab
Conductivity 3/	N/A	N/A	Continuous	Recorder
Cycles of Concentration	N/A	N/A	1/week	Calculation

Chlorine may be discharged continuously; however, discharge of total residual chlorine shall not exceed a maximum instantaneous concentration of 0.10 mg/l.

Discharge temperature shall not exceed the lowest temperature of the recirculating cooling water prior to the addition of make-up.

There shall be no discharge of detectable amounts of materials added for corrosion inhibition (including but not limited to zinc, chromium and phosphorus) or any chemicals added which contain the 129 priority pollutants.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/day.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): discharge from each cooling tower prior to mixing with other waste streams except that temperature and chlorine may be monitored after combination of 009 and 010.

1/ During the first two-month period of substantially full power operation of each unit, analyses shall follow each application of chlorine to the condenser cooling water system until sufficient operating experience has been obtained to assure conformance with limitations and then analysis frequency may be reduced to one day per week.

2/ Limitation and monitoring requirement are not applicable if permittee does not add compounds containing phosphorus to the condenser cooling water system.

3/ Reporting shall be in mg/l of Total Dissolved Solids.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 011 - Coal Storage Area Runoff from Units 4 and 5

Such discharges shall be limited and monitored by the permittee as specified below:

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Effluent Characteristic	Discharge Limitations	Monitoring Requirements 1/	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	1/week	Weir Reading 3/
Total Suspended Solids (mg/l)	50 1/2/	1/week	Grab
Metals Monitoring	See Below	1/month	Grab

Monitoring for metals shall include total arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. In the event that no discharge occurs during the three-month reporting period, a sample for metals analysis shall be taken in the pond near the effluent point.

Note: Monitoring requirements are applicable only during periods of discharge except as noted for metal monitoring.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): point(s) of discharge from treatment system prior to mixing with other waste streams.

1/ Applicable to any flow up to the flow resulting from a 24-hour rainfall event with a probable recurrance interval of once in ten years. If an impoundment is utilized by permittee, it shall be capable of containing a 10-year, 24-hour rainfall event.

2/ In the event that the effluent concentration exceeds this limitation, the permittee may attempt to demonstrate that treatment in the runoff retention system assured compliance prior to discharge to the discharge canal.

3/ An event recorder shall also be provided and the number of discharges per month shall be reported quarterly.

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 012 - Ash Pile Runoff from Units 4 and 5

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	1/week	Weir Reading 2/
Total Suspended Solids (mg/l)	1/	1/week	Grab
Metals Monitoring	See Below	1/month	Grab

Monitoring for metals shall include total arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. In the event that no discharge occurs during the three-month reporting period, a sample for metals analysis shall be taken in the pond near the effluent point.

Note: Monitoring requirements are applicable only during periods of discharge except as noted for metal monitoring.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Point(s) of discharge from treatment system piror to mixing with other waste streams.

1/ Pending repromulgation of effluent guidelines for this waste category, limitations on total suspended solids shall not be applicable. Within 90 days of repromulgation, permittee shall submit a proposed implementation schedule and shall expeditiously complete necessary facilities, if any, to assure compliance with such repromulgated regulations.

2/ An event recorder shall also be provided and the number of discharges per month shall be reported quarterly.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of discharge and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 013 - Runoff Collection System Overflow from Units 4 and 5

Such discharges shall be limited and monitored by the permittee as specified below:

DRAFT

Effluent Characteristic	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	1/day	weir reading 2/
Total Suspended Solids (mg/1)	50 1/	2/week	Grab
Metals Monitoring	See Below	1/month	Grab
Oil and Grease (mg/1)	N/A	1/week	Grab

Monitoring for metals shall include total arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. In the event that no discharge occurs during the three-month reporting period, a sample for metals analysis shall be taken in the pond near the effluent point.

Note: Monitoring requirements are applicable only during periods of discharge except as noted for metal monitoring.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/day 1/.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): point(s) of discharge from treatment system prior to mixing with other waste streams.

1/ Applicable to any flow up to the flow resulting from a 24-hour rainfall event with a probable recurrance interval of once in ten years. If an impoundment is utilized by permittee, it shall be capable of containing a 10-year, 24-hour rainfall event.

2/ An event recorder shall also be provided and the number of discharges per month shall be reported quarterly.

DRAFT

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on start of intake and lasting through expiration the permittee shall monitor serial number(s) 014 - Intake Units 4 and 5

Such intake(s) shall be monitored by the permittee as specified below:

Influent Characteristic	Discharge Limitations		Monitoring Requirements	
	Daily Average	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	N/A	Continuous	Pump logs
Total Dissolved Solids (mg/l)	N/A	N/A	1/week	Grab
Calcium (mg/l)	N/A	N/A	1/week	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Plant intake.

Intake screen backwash may be discharged after passage through a trash removal basket without limitation or monitoring requirements.

DRAFT

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

   a. Achieve compliance with effluent limitations (009 through 013)- On start of discharge(s)

   b. Plume evaluation (see Part III.E.)

      (1) First report - 15 months after commercial operation date of Unit 4
      (2) Second report - 15 months after commercial operation date of Unit 5

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

   Note: Any construction of new waste treatment facilities or alterations to existing waste treatment facilities will require a permit or authorization for construction in accordance with applicable state law and regulation.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Chief, Water Enforcement Branch
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

3. *Definitions*

a. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

c. "Weighted by flow" means the summation of each sample concentration times its respective flow in convenient units divided by the summation of the flow values.

d. "Nekton" means free swimming aquatic animals whether of freshwater or marine origin.

e. For the purpose of this permit, a calendar day is defined as any 24-hour period, except that for temperature and flow it shall be from midnight to midnight.

f. For the purpose of this permit, continuous measurement frequency is defined as measurements taken at intervals of no greater than one hour each.

g. "Multiple grabs" shall mean samples taken of intervals of no greater than 15 minutes over the entire period of total residual chlorine discharge.

h. "Two-hour average" shall mean an average of all values obtained in a continuous 120-minute period.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

A. MANAGEMENT REQUIREMENTS

1. *Change in Discharge*

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. *Removed Substances*

Solids, sludges, filter backwash or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected hereby.

PART III

DRAFT

OTHER REQUIREMENTS

A. In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

B. If the permittee, after monitoring for at least 12 months, determines that he is consistently meeting the effluent limits contained herein, the permittee may request of the Regional Administrator that the monitoring requirements be reduced to a lesser frequency or be eliminated.

C. There shall be no discharge of polychlorinated byphenyl compounds such as those commonly used for transformer fluid.

D. The company shall notify the Regional Administrator in writing not later than sixty (60) days prior to instituting use of any additional biocide or chemical used in cooling systems, other than chlorine, which may be toxic to aquatic life other than those previously reported to the Environmental Protection Agency. Such notification shall include:

1. name and general composition of biocide or chemical,
2. frequencies of use,
3. quantities to be used.,
4. proposed discharge concentrations, and
5. EPA registration number, if applicable.

DRAFT

E. Effluent discharge shall be designed and operated to assure compliance with Florida Water Quality Standards limitations (pH-6.0 to 8.5, total residual chlorine-0.01 mg/l, copper 0.015 mg/l, etc.) at a distance of 150 meters (492 feet) from the point of discharge into the discharge canal under all expected operating modes of Units 1-5. Subsequent to commercial operation of each unit, field measurements (supplemented as necessary with modeling results) shall be conducted to determine the three dimensional configuration of the discharge plume, determine minimum dilution factor expected, and substantiate conformance with the 150-meter (492 foot) mixing zone. Reports on this study shall be submitted not later than 15 months after the commercial operation dates of Units 4 and 5, respectively.

F. Permittee shall maintain daily records of rainfall at the plant site.

G. There shall be no point source discharge of the following categories of wastes to Waters of the United States or to any waste stream which enters such Waters: construction runoff, low volume wastes (including, but not limited to wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculating house service water system), metal cleaning wastes (cleaning compunds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning and specifically including such water wash operations as hosing down boiler fireside surfaces), sanitary wastes and boiler blowdown. Event recorders shall be placed at all overflow points from evaporation/seepage ponds receiving such wastes to assure compliance with this requirement.

H. The Permittee shall implement the leachate testing and monitoring program for the ash disposal area as generally specified in Special Condition XII.A. of the State Power Plant Site Certification Order issued by the Governor and Cabinet on November 21, 1978, (hereinafter "Order") and as submitted to EPA on October 4, 1979. Status reports on the program shall be submitted monthly in conformance with the requirements of the Order. Based on results of the program, the Permittee shall select an environmentally sound ash disposal strategy acceptable to EPA and the State, provided that the disposal strategy shall meet any applicable EPA or State regulations whichever are more stringent. The Permittee shall consult with and obtain EPA and State approval prior to initiating changes in the ash disposal strategy.

I. The Permittee shall consult with EPA and the State at such time as the need for additional ash disposal site(s) or new coal storage area(s) is identified. Consultation shall be initiated at a sufficiently early time so as to provide adequate opportunity for a thorough evaluation of the environmental impacts of the proposed action. No site other than those described in the EIS shall be used for Units 4 and 5 without prior approval of the Director, Enforcement Division.

J. The Permittee shall line the area of any coal pile containing coal with a pyritic sulfur content of greater than 0.2% in conformance with Special Condition XII.B. of the Order.

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K. The Permittee shall implement a groundwater monitoring program* designed to assess whether leachate from the plant drains collection pond, ash disposal area, and all coal piles necessary to support operation of Units 4 and 5 is significantly contaminating the groundwater. The program approved by EPA and the State shall be implemented not later than one year prior to receipt of coal for Units 4 or 5. Reporting shall be quarterly in conformance with requirements of the Order and shall commence four months after operation of the first unit.

Should the reports demonstrate significant contamination of groundwater is occurring, the Permittee shall immediately institute reasonable corrective measures acceptable to EPA and the State to mitigate the problem and to ensure that no further significant leaching occurs. These measures may include but not be limited to: sealing, relocating, or altering operations of the ash disposal area, plant drains collection pond, or coal piles. If the reports demonstrate no significant contamination is occurring, the Permittee after consultation with and approval by the Director, Enforcement Division may reduce or eliminate the monitoring program.

In the event that changes in the monitoring program become necessary such changes shall be approved by the Director, Enforcement Division and the State Director prior to institution.

L. The Permittee shall ensure that contractors, whose activities may impact manatees, instruct all personnel associated with such activities about the potential presence of manatees in the area and that all vessels associated with the project shall operate at "no wake" speeds at all times while in shallow waters of channels where the draft of the boat provides less than three feet clearance of the bottom. The Permittee shall ensure that all personnel are advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act and that the contractor is notified it shall be held responsible for any manatee harmed, harassed or killed as a result of any of its activities.

The Permittee shall provide written documentation that all affected parties have been informed of this condition.

M. The Permittee shall commence a salt drift monitoring program** approved by EPA and the State at least one year prior to the operation of the first cooling tower. The program shall be of sufficient scope to document ambient levels and to allow for evaluation of the operational effects of Units 4 and 5 on vegetation in the area surrounding the Crystal River site. Program progress reports and monitoring reports shall be submitted quarterly commencing with implementation of the salt drift monitoring program. The program shall be conducted for at least two years following operation of the second tower.

---

* A detailed program (including well description and location, sampling procedures, paramaters to be assayed, and analytical methodologies) shall be submitted prior to issuance of the Final EIS and will be summarized therein.

**A detailed program shall be submitted prior to issuance of the Final EIS and will be summarized therein.

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If the reports indicate significant impacts are occurring to the nearby area, the Permittee shall consult with EPA and the State and shall initiate reasonable corrective measures acceptable to EPA and the State to mitigate these impacts. Should the reports indicate no significant impacts are occurring to the nearby area, the Permittee after consultation with and approval by the Director, Enforcement Division may reduce or eliminate the monitoring program.

Cooling towers shall be designed and operated to assure a maximum drift rate of 0.0005%of the circulation water rate as indicated in the Draft EIS. Tests showing compliance with this requirement shall be submitted within three months of the commercial operation of each unit. Subsequent tests of each tower shall be conducted every second year with a report submitted to the Director, Enforcement Division not later than three months following the required date of testing.

N. In accordance with Section 306(d) of the Clean Water Act (33 USC Section 1251, et seq.) effluent limitations based on standards of performance contained in this permit shall not be made any more stringent during a ten year period beginning on the date of completion of such construction or during the period of depreciation or amortization of such facility for the purposes of Section 167 or 169 (or both) of the Internal Revenue Code of 1954, whichever period ends first. The provisions of Section 306(d) do not limit the authority of the Environmental Protection Agency to modify the permit to require compliance with a toxic effluent limitation promulgated under BAT or toxic pollutant standard established under Section 307(a) of the Clean Water Act, or to modify, as necessary, to assure compliance with any applicable State Water Quality Standard. This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under sections 301(b)(2) (C), and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

(1) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
(2) Controls any pollutant not limited in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

O. The State of Florida Department of Environmental Regulation has certified the discharge(s) covered by this permit with conditions (Attachment B). Section 401 of the Act requires that conditions of certification shall become a condition of the permit. The monitoring and sampling shall be as indicated for those parameters included in the certification.

Any effluent limits and any additional requirements specified in the attached state certification which are more stringent, supersede any less stringent effluent limits provided herein. During any time period in which the more stringent state certification effluent limits are stayed or inoperable, the effluent limits provided herein shall be in effect and fully enforceable.

ATTACHMENT A
Permit No. FL0036366

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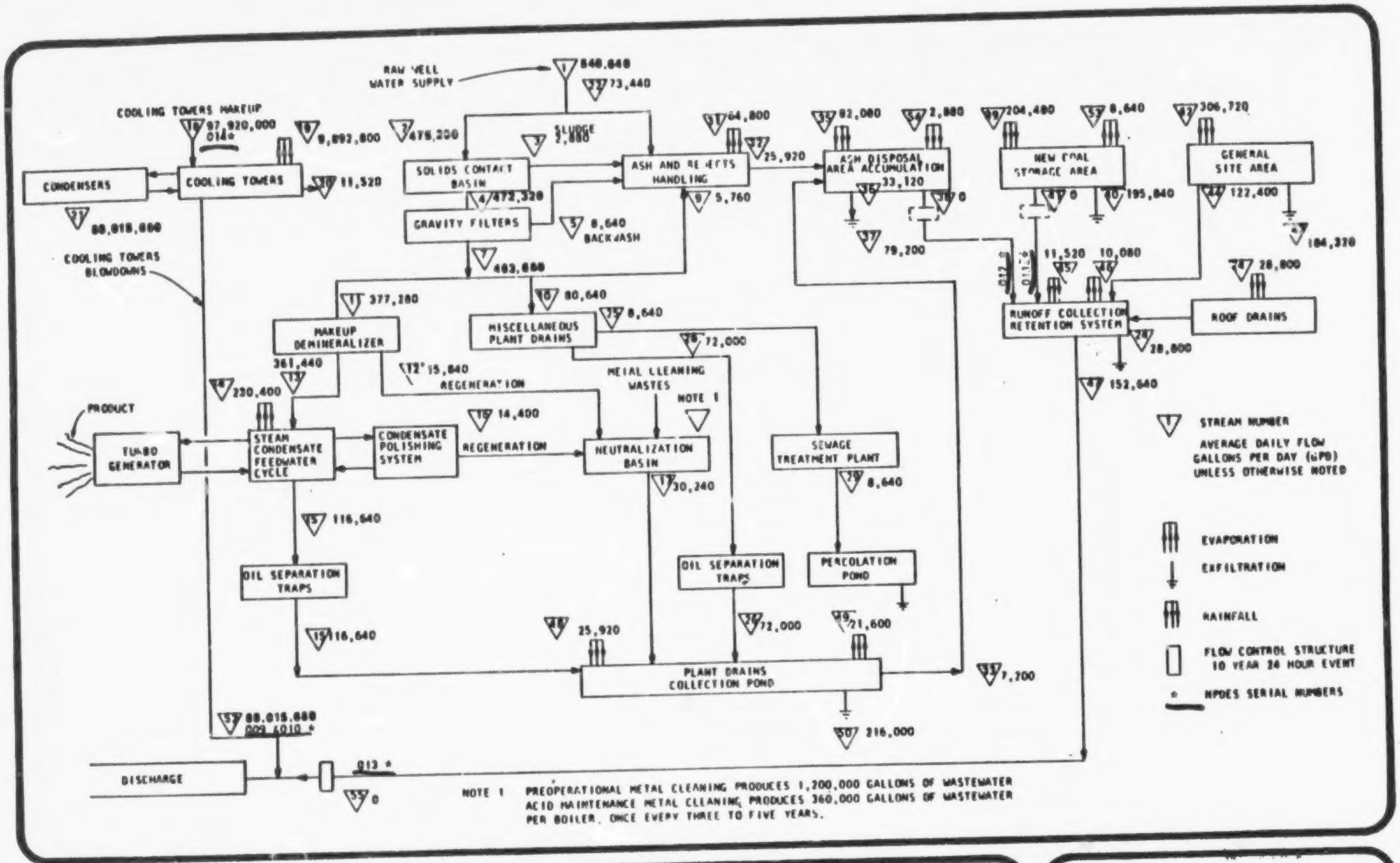
RAW WELL WATER SUPPLY
1 840,840
33 73,440
COOLING TOWERS MAKEUP
18 97,920,000
014*
8 9,892,800
2 476,200
SLUDGE 2,880
3
CONDENSERS
COOLING TOWERS
30 11,520
SOLIDS CONTACT BASIN
4 472,320
GRAVITY FILTERS
5 8,640 BACKWASH
ASH AND REJECTS HANDLING
31 64,800
32 25,920
9 5,760
ASH DISPOSAL AREA ACCUMULATION
35 82,080
34 2,880
36 33,120
38 0
37 79,200
39 204,480
NEW COAL STORAGE AREA
53 8,640
41 0
40 195,840
42 306,720
GENERAL SITE AREA
44 122,400
43 184,320
21 88,018,080
COOLING TOWERS BLOWDOWNS
7 483,880
11 377,280
10 80,640
MISCELLANEOUS PLANT DRAINS
25 8,640
26 72,000
MAKEUP DEMINERALIZER
361,440
13
12 15,840
REGENERATION
14 230,400
METAL CLEANING WASTES
NOTE 1
PRODUCT
TURBO GENERATOR
STEAM CONDENSATE FEEDWATER CYCLE
CONDENSATE POLISHING SYSTEM
16 14,400
REGENERATION
NEUTRALIZATION BASIN
17 30,240
SEWAGE TREATMENT PLANT
28 8,640
15 116,640
OIL SEPARATION TRAPS
OIL SEPARATION TRAPS
PERCOLATION POND
15 116,640
48 25,920
27 72,000
49 21,600
PLANT DRAINS COLLECTION POND
51 7,200
50 216,000
52 88,015,680
009 &010 *
DISCHARGE
013 *
55 0
012 *
011 *
45 11,520
46 10,080
47 28,800
RUNOFF COLLECTION RETENTION SYSTEM
ROOF DRAINS
29 28,800
47 152,640
STREAM NUMBER
AVERAGE DAILY FLOW GALLONS PER DAY (GPD) UNLESS OTHERWISE NOTED
EVAPORATION
EXFILTRATION
RAINFALL
FLOW CONTROL STRUCTURE 10 YEAR 24 HOUR EVENT
* NPDES SERIAL NUMBERS

NOTE 1 PREOPERATIONAL METAL CLEANING PRODUCES 1,200,000 GALLONS OF WASTEWATER ACID MAINTENANCE METAL CLEANING PRODUCES 360,000 GALLONS OF WASTEWATER PER BOILER, ONCE EVERY THREE TO FIVE YEARS.

Figure 3.3-1

PLANT WATER USE DIAGRAM

SOURCE: Black and Veatch, 1980

FLORIDA POWER CORPORATION

PROPOSED
CRYSTAL RIVER UNITS 4 & 5

CITRUS COUNTY, FLORIDA

ATTACHMENT B
Permit No. FL0036366

STATE CERTIFICATION

Units 4 and 5

(To be included with permit prior to issuance)

Crystal River Power Plant
Units 4 and 5
Permit Rationale
NPDES No. FL0036366

I. Applicable Regulations

A. Federal performance standards for new sources: Chemical wastes (40 CFR 423.15) and area runoff (40 CFR 423.45).

B. Florida Water Quality Standards: Receiving waters are classified as Class III waters - Recreation - Propagation and Management of Fish - Surface Waters (Florida Administrative Code. Chapters 17-3, 17-4 and 17-6)

C. Florida Site Certification (FSC). Florida Administrative Code, Chapter 403.

II. Effluent Limitations

A. Outfall serial numbers 009 and 010.

1. Temperature: Two-hour maximum average blowdown temperature of 34.2 C (96.0 F) as requested by the applicant has been incorporated, consistent with the Florida Site Certification (FSC).

2. Phosphorus - 10 mg/l limitation as requested by the applicant. The applicant feels that a phosphate compound may be necessary as a scale inhibition (not corrosion inhibitor). Addition will not initially be implemented and will be started only if necessary for proper cooling tower operation. Monitoring is therefore only required if addition is implemented.

3. Chlorine - Limitations proposed are consistent with requirements of Florida Water Quality standards Sections 17-3.051(1)(d), - 3.121(10) and - 4.244(4).

4. Corrosion inhibiting substances. Prohibited in accordance with 40 CFR 423.15(i).

5. pH: Range of 6.0 to 9.0 in accordance with 40 CFR 423.15(a).

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B. Outfall serial number 011.
   1. Total suspended solids. 50 mg/l limitation consistent with 40 CFR 423.45(a) and (b).
   2. pH: Included in serial 013.
   3. Metals monitoring. Required to quantify waste characteristics and assure compliance with Florida Water Quality Standards requirements.

C. Outfall serial number 012.
   1. No limitations due to remand of regulations. Otherwise included in serial 013.
   2. Monitoring. Required to quantify waste characteristics and assure compliance with Florida Water Quality Standards requirements.

D. Outfall serial number 013 - Runoff Collection System Overflow (includes 011 and 012)
   1. Total Suspended Solids - 50 mg/l limitation consistent with 40 CFR 423.45 (a) and (b), although remanded and FSC requirements.
   2. pH. Range of 6.0 to 9.0 in accordance with 40 CFR 423.15(a).
   3. Other monitoring. Required to quantify waste characteristics and assure compliance with Florida Water Quality Standards requirements.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4 - ATLANTA, GEORGIA

WATER ENFORCEMENT
BRANCH
JUL 23 1980
EPA-REGION
ATLANTA, GA

DATE: July 21, 1980

SUBJECT: EIS Review - Crystal River Units 4 and 5

FROM: Water Quality Standards Coordinator

TO: Charles H. Kaplan, Enforcement Division
John Hagan, EIS Review Branch

SUMMARY

We have received and reviewed the referenced draft TSD and EIS, and observe that:

1. There will be no discharge to surface waters of wastewaters from Crystal River units 4 and 5, except that cooling tower blowdown from these units will be discharged to an existing canal, and thence to the Gulf of Mexico.
2. All waste streams from units 4 and 5, other than chlorinated cooling tower blowdown, will be diverted to the plant drains collection pond, from which there is no discharge to surface waters.
3. A mixing zone ending 150 meters downstream of the POD for units 4 and 5 has been established for pH, and will also be used as a mixing zone for total residual chlorine (TRC).
4. The state TRC criteria applicable to those waters require that:
    a. "Chlorine (total residual) - shall not exceed 0.01 mg/l"
    [Chapter 17.3.111(7), F.A.C.]
    b. "...in no event shall the maximum concentration of wastes in the mixing zone exceed the amount lethal to 50% of the test organisms in 96 hours (96 hr LC_{50}) for a species signifiant to the indigenous aquatic community."
    [Chapter 17-4.244(4), F.A.C.]

Furthermore, Chapter 17-4.244(5), F.A.C., indicates that the provisions of section 17-3.051 apply. For toxic substances, such as chlorine, section 17-3.051 requires that:

> "All waters of the state shall at all places and at all times be free from:
>
> 1. ...discharges which, alone or in combination...
>   d. Are actuely toxic..."

B-V

and section 17-3.021(1) defines acute toxicity as follows:

> "(1) "Acute toxicity" shall mean the presence of one or more substances...in amounts which:
>
> (a) are greater than one-third (1/3) of the amount lethal to 50% of the test organisms in 96 hours (96 hrs LC_{50})...for a species significant to the indigenous aquatic community..."

It appears then, that in adopting these rules, the more stringent toxicity cirtieria of Ch. 17-3.051 were inadvertently included in the mixing zone regulations of Ch. 17-4.244. Provided the state concurs, however, EPA chooses to interpret that, for mixing zones only, the toxicity criteria stated in section 17-4.244(4) supersedes that in section 17.3.051(1).

Species "significant to the indigenous aquatic community" include the Blue Crab, Callinectes sapidus, for which the 96 hr LC_{50} (chlorine) has been determined to be 0.1 mg/l. Therefore, the concentration of TRC at any point within the mixing zone may not exceed 0.1. mg/l.

5. We are assured that, even under worst case conditions, the once-through cooling water discharge from units 1, 2, and 3 will provide a minimum of 10:1 dilution of the discharge from units 4 and 5, and we observe that no TRC is documented for this cooling water. Assuming complete mix actually occurs within the mixing zone, and neglecting any chlorine demand, the blowdown discharge from units 4 and 5 should contain no more than 0.1 mg/l TRC in order to meet the Class III limitation a the end of the mixing zone, and in order to meet the toxicity limitations at all points within the mixing zone. We observe that the applicant anticipates no TRC in the cooling tower blowdown at the POD.

We conclude, therefore, that a discharge limitation of 0.1 mg/l TRC at the POD for units 4 and 5, and a requirement that pH vary no more than 1 unit from background at the end of the mixing zone, will be compatible with state standards.

BACKGROUND

Request for review of EIS, and your additional comments of June 30, 1980.

ACTION

For your use.

R F McGhee
Robert F. McGhee

Appendix B
NPDES Permit, Units 1, 2, and 3

B-1

STATUS OF NPDES PERMIT
CRYSTAL RIVER POWER PLANT
UNITS 1, 2 and 3
NPDES PERMIT NUMBER FL0000159

The National Pollutant Discharge Elimination System (NPDES) Permit for Units 1, 2 and 3 of the Crystal River Power Plant was issued initially on December 31, 1974. The permit was subsequently modified on July 9, 1979. The permit expired on February 28, 1980; however, the Permittee, Florida Power Corporation, filed a timely and sufficient application for a new permit. Reissuance of the permit has been delayed due to the expected imminent proposal of revisions to the effluent limitations and guidelines for the Steam Electric Industry which would significantly impact effluent limitations for Units 1, 2 and 3. Under the provisions of subsection 122.12(b) of the Clean Water Act (33 U.S.C. Section 1251 et seq.), the terms and conditions of the expired permit are automatically continued under the Administrative Procedures Act (5 U.S.C. Section 558(c)) pending issuance of a new permit. At such time as EPA proposes to issue a new permit, a public notice of the proposed issuance and notice of consideration for State certification will be published.

B-2

Permit No. FL0000159
Application No. FL 074 OYL 2 000020

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

Florida Power Corporation
P.O. Box 14042
St. Petersburg, Florida 33733

is authorized to discharge from a facility located at

Crystal River Power Plant
Units 1, 2, and 3
Citrus County, Florida

to receiving waters named Gulf of Mexico
from discharge points enumerated herein as serial numbers 001, 002, 003, 004, 005, 006 007, and 008,

during the effective period of this permit

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit is a modification of the NPDES permit issued for this facility on December 31, 1974, and replaces that permit in its entirety. This modified permit shall become effective on July 23, 1979.

This modified permit and the authorization to discharge shall expire at midnight, February 28, 1980. Permittee shall not discharge after the above date of expiration without prior authorization. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information, forms, and fees as are required by the Agency authorized to issue NPDES permits no later than 180 days prior to the above date of expiration.

Signed this 9th day of July, 1979

Howard Zeller/acting for
Sanford W. Harvey, Jr., Director
Enforcement Division

B-3

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on effective date and lasting through 1/ the permittee is authorized to discharge from outfall(s) serial number(s) 001, 002 and 005 - Once through cooling water from Units 1, 2, and 3, respectively, discharged to the discharge canal to the Gulf of Mexico

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations Chlorination Period Average	 Daily Maximum	Monitoring Requirements Measurement Frequency	 Sample Type
Flow-m^3/Day (MGD)	N/A	4.38(100) 1/	Continuous	Recorder or pump logs
Discharge Temperature °C(°F)	See Below		Continuous	Recorders or logs
Temperature Rise °C(°F)	See Below		Continuous	Recorders or logs
Total Residual Chlorine (mg/1)	See Below		1/week	Multiple grabs

The temperature of the condenser cooling water at the bulkhead line shall not exceed 39.4(103) for a period of more than three consecutive hours or a maximum of 41.1(106). Daily maximum temperature rise across the condensers of Units 1, 2, and 3 shall not exceed 9.4(17.0), 9.4(17.0), and 9.7(17.5), respectively. Neither shall the temperature rise across the condenser of Unit 3 exceed 9.7(17.5) for a period of more than three consecutive hours nor a maximum of 11.7(21). In the event of an emergency need for power, temperature excursions beyond the above limitations, consistent with the emergency, are permitted. Notification of such conditions and temperature excursion magnitude(s) shall be made to Chief, Water Enforcement Branch within five days. Emergency Need For Power is defined as any event causing authorized Federal officials to require or request that the Florida Power Corporation supply electricity to points within or without the State or other emergencies declared by State, County, or Municipal authorities during which an uninterrupted supply of electric power is vital to public health and safety, or the permittee determines that there is inadequate capacity to meet public demand for power from all available power units and purchases.

Total residual chlorine shall not exceed 0.5 mg/1 in the discharge from any individual condenser (4 condensers per unit). Chlorination shall be limited to one hour per day per individual unit and no two condensers shall be chlorinated simultaneously. In the event that the units cannot be operated at or below this level of chlorination, the permittee may submit a demonstration, based on toxicity data, that discharge of higher levels of chlorine are consistent with the Florida Water Quality Standards. Effluent limitations will be modified consistent with an acceptable demonstration.

Samples taken in compliance with these monitoring requirements specified above shall be taken at the following location(s): Chlorine at the outlet corresponding to an individual condenser (4 condensers per Unit), flow from combined circulating water pumps, and temperature at the intake and outlet corresponding to an individual unit (inlet temperature is the average of the temperatures measured at the inlets to the four condensers and outlet temperature is the average of the temperatures measured at the outlets from the four condensers), and the intersection of the discharge canal and the original bulkhead line.

1/ As approved by the Regional Administrator after final determination under Section 316. Limitations are subject to modification consistent with the final determination.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on effective date and lasting through expiration date of the permit the permittee is authorized to discharge from outfall(s) serial number(s) 003(Units 1 and 2) and 007 (Unit 3)- Intake screen wash water discharged to the plant intake canal.

Permittee may discharge intake screen wash water without limitations and monitoring requirements.

B-5

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on effective date and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 004 - Ash pond discharge (Units 1 and 2)

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (mg/1)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow—m^3/Day (MGD)	N/A	N/A	N/A	N/A	1/week	Grab
Oil and Grease	260(560)	340(750)	15	20	1/week	Grab
Total Suspended Solids	510(1130)	1700(3750)	30	100	1/week	Grab
Heavy Metals			See Below		1/month	Grab

Monitoring for heavy metals shall include total arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc.

Note: Limitations and monitoring requirements are not applicable during periods of no discharge.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/week.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): discharge from ash pond prior to mixing with any other waste stream.

B-6

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on effective date and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 006 - Nuclear Services and decay heat seawater system discharged to the Gulf of Mexico
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Chlorination Period Average	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	N/A	N/A	Continuous	Recorder or pump logs
Total residual chlorine (mg/l)	See Below		1/week	Multiple grabs

Total residual chlorine shall not exceed 0.5 mg/l in the discharge. Chlorination shall be limted to one hour per day and shall not be conducted during chlorination of any condensers. In the event that the units cannot be operated at or below this level of chlorination, the permittee may submit a demonstration, based on toxicity data, that discharge of higher levels of chlorine are consistent with the Florida Water Quality Standards. Effluent limitations will be modified consistent with an acceptable demonstration.

Control of radwaste discharges through this outfall serial number is vested in the U.S. Nuclear Regulatory Commission under the provisions of License DPR-72 and no additional limitations are provided herein.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Chlorine at point of discharge prior to mixing with any other waste stream and flow at the combined intake water pumps.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on effective date and lasting through expiration the permittee is authorized to discharge from outfall(s) serial number(s) 008 - Coal pile runoff (Units 1 and 2).

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations	Monitoring Requirements	
	Instantaneous Maximum	Measurement Frequency	Sample Type
Flow-m3/Day (MGD)	N/A	1/week	Grab
Total Suspended Solids (mg/1)	50 1/	1/week	Grab

Note: Limitations and monitoring requirements are not applicable during periods of no discharge.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/week on a grab sample 1/.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): point(s) of discharge from treatment system prior to mixing with any other waste stream.

1/ Applicable to any flow up to the flow resulting from a 24-hour rainfall event with a probable recurrance interval of once in ten years. If an impoundment is utilized by permittee, it shall be capable of containing a 10 year 24 hour rainfall event.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

   a. Intake canal modification (III.F.)
      (1) Progress report - 8/31/79
      (2) Progress report - 2/29/80
      (3) Progress report - 8/31/80
      (4) Complete dredging and related construction - 2/28/81

   b. Thermal/biological post operational monitoring (III.G.)
      (1) 1st report - 3/31/79
      (2) Subsequent reports - annually after 1st report

   c. 316(a) and 316(b) study (III.H.)
      (1) Submit plan - 8/31/79
      (2) Implement - 6 months after completion of dredging, but not later than 9/1/81
      (3) Report - 18 months after implementation, but not later than 2/28/83

   d. Effluent flow reduction (001, 002 and 005)
      (1) Detailed implementation schedule - *
      (2) Progress report - *
      (3) Progress report - *
      (4) Progress report - *
      (5) Progress report - *
      (6) Achieve operational level - *

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

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* As approved by the Regional Administrator after final determination under Section 316.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on February 28, 1975. Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Chief, Water Enforcement Branch
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

AND

Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

3. *Definitions*

a. The "daily average" concentration means the arithmetic average (weighted by flow) of all the daily determinations of concentration made during a calendar month. Daily determinations of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow) of all the samples collected during that calendar day.

b. The "daily maximum" concentration, flow and temperature means the arithmetic average of all the determinations made for any calendar day.

c. "Weighted by flow" means the summation of each sample concentration times its respective flow in convenient units divided by the summation of the flow values.

d. "Nekton" means free swimming aquatic animals whether of freshwater or marine origin.

e. For the purpose of this permit, a calendar day is defined as any 24-hour period, except that for temperature and flow it shall be from midnight to midnight.

f. For the purpose of this permit, continuous measurement frequency is defined as measurements taken at intervals of no greater than one hour each.

g. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

h. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

B-11

A. MANAGEMENT REQUIREMENTS

1. *Change in Discharge*

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public

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inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected hereby.

PART III

OTHER REQUIREMENTS

A. In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

B. If the permittee, after monitoring for at least six months, determines that he is consistently meeting the effluent limits contained herein, the permittee may request of the Director, Enforcement Division that the monitoring requirements be reduced to a lesser frequency or be eliminated.

C. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

D. The company shall notify the Director, Enforcement Division in writing not later than sixty (60) days prior to instituting use of any additional biocide or chemical used in cooling systems, other than chlorine, which may be toxic to aquatic life other than those previously reported to the Environmental Protection Agency. Such notification shall include:

1. name and general composition of biocide or chemical,
2. frequencies of use,
3. quantities to be used,
4. proposed discharge concentrations, and
5. EPA registration number, if applicable.

E. Two copies of the annual "Non-radiological Environmental Operating Reports" and "Special Surveillance Studies" reports submitted to the U. S. Nuclear Regulatory Commission as required by the Environmental Technical Specifications shall be submitted to the Chief, Water Enforcement Branch.

F. Permittee shall deepen the the facility intake canal to a navigational depth of approximately 6 meters (20 feet) no later than February 28, 1981.

Approval for construction necessary for these modifications shall be obtained prior to construction in accordance with State and Federal laws and regulations.

G. Permittee shall continue the approved thermal/biology post operational monitoring plan until the start of the comprehensive 12-month study. Annual reports of this study shall be submitted no later than March 31 of each year.

H. Not later than August 31, 1979, permittee shall submit a detailed plan for a comprehensive 12-month 316(a) study to assure that the thermal discharge provides for the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water body and 316(b) study to assure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Permittee shall implement an approved program by six months after completion of dredging, but not later than September 1, 1981. A final report on this program shall be submitted by 18 months after implementation, but not later than February 28, 1983.

Based on these studies, the Regional Administrator shall make a determination as to the possible need for procedure modification, facility construction, reduced thermal discharge or reduced intake flow. Ninety (90) days after opportunity for hearing and review, permittee shall submit for approval an implementation schedule to assure conformance with requirements of the Regional Administrator's determination.

I. There shall be no point source discharge of the following categories of wastes to Waters of the United States or to any waste stream which enters such Waters: low volume wastes (including, but not limited to wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculating house service water systems), metal cleaning wastes (cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning and specifically including such water wash operations as hosing down boiler fireside surfaces), sanitary wastes, boiler blowdown and construction runoff. Event recorders shall be placed at all overflow points from evaporation/seepage ponds receiving such wastes to assure compliance with this requirement.

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J. Copies of all plans and reports submitted in accordance with Parts III. G. and H. herein shall be submitted as follows:

Number of Copies	Addressee
3	Director, Enforcement Division, EPA(Atlanta)
1	Chief, Ecology Branch (Athens)
2	Director for Environmental Projects, NRC (Bethesda)
1	Regional Director, Fish & Wildlife Service (Jacksonville)
1	Area Manager, Fish & Wildlife Service (Jacksonville)
2	NPDES Permits Administrator, Florida Dept. of Environmental Regulation (Tallahassee)
1	Regional Director, National Marine Fisheries Service (St. Petersburg)

K. The State of Florida Department of Environmental Regulation has certified the discharge(s) covered by this permit with conditions (Attachment B). Section 401 of the Act requires that conditions of certification shall become a condition of the permit. The monitoring and sampling shall be as indicated for those parameters included in the certification.

Any effluent limits, and any additional requirements, specified in the attached state certification which are more stringent supersede any less stringent effluent limits provided herein. During any time period in which the more stringent state certification effluent limits are stayed or inoperable, the effluent limits provided herein shall be in effect and fully enforceable.

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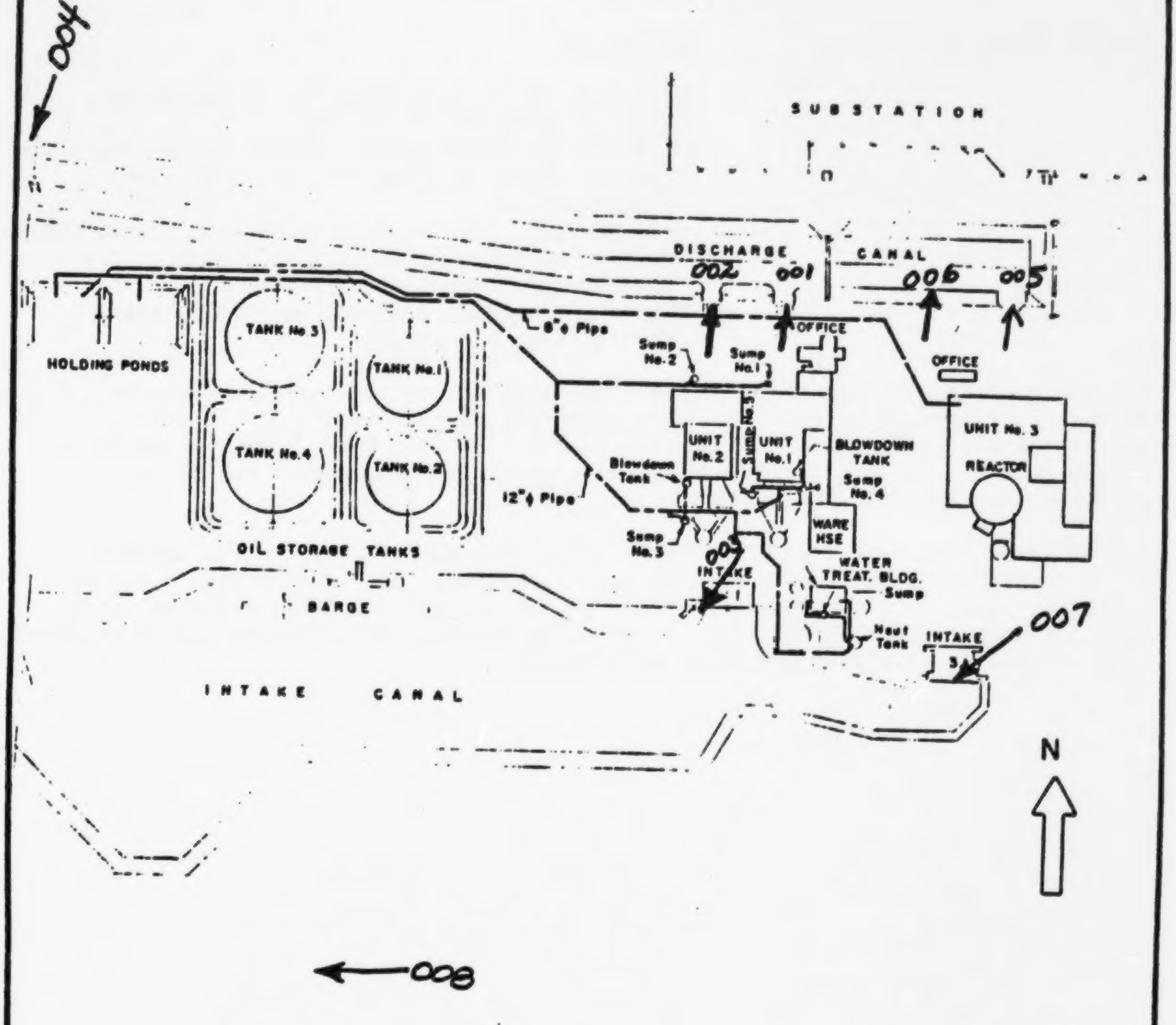
ATTACHMENT A
Permit No. FL0000159


004
SUBSTATION
DISCHARGE
CANAL
002
001
006
005
8"φ Pipe
OFFICE
OFFICE
Sump No. 2
Sump No. 1
HOLDING PONDS
TANK No. 3
TANK No. 1
TANK No. 4
TANK No. 2
Sump No. 5
UNIT No. 2
UNIT No. 1
BLOWDOWN TANK
UNIT No. 3
REACTOR
Blowdown Tank
12"φ Pipe
Sump No. 4
Sump No. 3
WARE HSE
003
INTAKE
WATER TREAT. BLDG.
Sump
OIL STORAGE TANKS
BARGE
Neut Tank
INTAKE
3
007
INTAKE CANAL
N
008

Units 1, 2 & 3

NO.	DATE	REVISION	BY	CK.	APP.

DATE 1-23-74 SCALE 1" = 400'-0" BY Granquist CK. __ APP. __

KEY PLAN
WASTE WATER DISPOSAL

PROJECT CRYSTAL RIVER PLANT

FPC

FLORIDA POWER CORPORATION
ST. PETERSBURG, FLORIDA

DRAWING NO. A-105-CR

B-18

ATTACHMENT B
Permit No. FL0000159

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
2600 BLAIR STONE ROAD
TWIN TOWERS OFFICE BUILDING
TALLAHASSEE, FLORIDA 32301

REUBIN O'D. ASKEW
GOVERNOR

JOSEPH W. LANDERS, JR.
SECRETARY

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ENFORCEMENT
DIVISION

May 5, 1978

Paul J. Traina
Director, Enforcement Division
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Dear Mr. Traina:

Pursuant to Section 401 of the Federal Water Pollution Control Act (33 USC 1251, 1341), the State of Florida hereby issues certification for:

Florida Power Corporation FL0000159
Crystal River Power Plant
Units 1, 2 and 3

an applicant for a National Pollutant Discharge Elimination System (NPDES) permit.

The permittee must comply with Chapter 403, Florida Statutes, and all applicable sections of Chapter 17, Florida Administrative Code, including but not limited to the water quality and waste treatment requirements of Chapter 17-3 and the permit requirements of Chapter 17-4.

Should the need for procedure modification, facility construction, reduced thermal discharge or reduced intake flow be determined, as provided in Part III of the NPDES permit, by the Environmental Protection Agency or the Department of Environmental Regulation, an appropriate notification to the applicant shall reflect such findings. The applicant will have 15 days after receipt of the notice by the President of the Florida Power Corporation within which to request a hearing pursuant to Chapter 120, Florida Statutes. If the applicant fails to file such a request, this certification becomes void and new permit conditions will be established.

The State of Florida certifies that if the applicant meets these conditions, its discharge will comply with the provisions of Sections 301 and 302 of the Act.

Paul J. Traina
Page two
FL0000159
May 5, 1978

Insofar as we can determine, there are no further limitations under Sections 306 and 307 applicable to this case.

Sincerely,

Paul C Parks
for Joseph W. Landers, Jr.
Secretary

JWL:btp

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ATTACHMENT C
Permit No. FL0000159

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

REUBIN O'D. ASKEW
GOVERNOR

JOSEPH W. LANDERS, JR.
SECRETARY

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

February 7, 1979

Paul J. Traina
Director, Enforcement Division
Region IV
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

RECEIVED
EPA/REGION IV
FEB 12 2 12 PM '79
ENFORCEMENT
DIVISION

Dear Mr. Traina:

Re: Proposed Modified Draft Permit
Florida Power Corporation
Crystal River Units I, II, III
FL0000159
Citrus County

After reviewing the proposed permit modifications in your re-draft dated December 29, 1978, the department has determined that our state certification dated May 5, 1978, will also apply to the modified permit for Units I, II, and III.

Issuance of the former certification and reconfirmation of its applicability to the aforementioned discharger does not constitute state water quality certification of any proposed dredge and/or fill activities which require federal permits pursuant to Section 404 of P.L. 92-500, as amended, nor does it address approval or disapproval of any dredge and/or fill activities planned to be conducted in waters of the state which require separate department permit(s) pursuant to Section 17-4.28, Florida Administrative Code.

Please contact me if you have any questions concerning this letter.

Sincerely yours,

Mickey D. Bryant

Mickey D. Bryant
Administrator, NPDES Section

MDB:sp
cc: District - Southwest
Florida Power Corporation

[illegible]
FEB [illegible]

Appendix C
Section 7 Letter (U.S. Fish and Wildlife Service Biological Opinion)

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P. O. BOX 95067
ATLANTA, GEORGIA 30347

March 16, 1979

Mr. John C. White
Regional Administrator
Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Dear Mr. White:

This letter presents the Biological Opinion of the U. S. Fish and Wildlife Service regarding the potential impacts of the Crystal River Power Plant Units 4 and 5 on the endangered Florida manatee (Trichechus manatus) and its Critical Habitat, and the threatened eastern indigo snake (Drymarchon corais couperi).

This opinion is based upon an administrative record on file in the Jacksonville Area Office. Following is a summary of this record. Your letter of November 7, 1978, requested formal consultation pursuant to Section 7 of the amended Endangered Species Act of 1973. The letter also answered some of our questions on construction and dredging which we had addressed on October 2, 1978. A similar request went to the Corps of Engineers. On December 15, the Corps supplied answers to the questions we had raised. Further information was supplied by the Florida Power Corporation in a letter to the Corps on January 10, 1979. This letter reflected spoil area changes, widening of cuts between old spoil areas, erecting manatee caution signs, and culvert installation. Fish and Wildlife Service personnel have conducted onsite examinations of the proposed sites.

It is our understanding that about 330 acres of uplands, much of which are suitable for indigo snakes, will be disrupted for the plant site. Surveys have not revealed the presence of indigo snakes, but since habitat is available these snakes are probably on the area. Even though 330 acres would be rendered unsuitable for the indigo snake, other sufficient habitat exists in the area.

After a careful review of findings by Fish and Wildlife Service personnel in the Jacksonville Area Office and the Atlanta Regional Office, it is our Biological Opinion that the sitings of units 4 and 5 are not likely to jeopardize the continued existence of the indigo snake or habitat determined to be essential to the species.

With regard to the dredging for the intake channel, the channel width will vary from 150 to 300 feet and the channel depth will be 20 feet at mean low water plus a 1-foot overdredge allowance. The length of the dredged channel will be 14 miles. An average of three 18-foot draft barges per week will be required to supply half of the coal for operating units 1, 2, 4, and 5. The other half of the coal is to be delivered by rail.

The Crystal River region of the gulf coast harbors approximately 100 manatees and concentrations in the river itself occur in the cooler months. During spring and fall, manatees moving to or from the warmer springs of the Crystal River pass through the intake channel of the power plant. Although manatees may be present in smaller numbers at any time of the year, larger numbers occur during these spring and fall movements.

In evaluating the impacts of the Crystal River Power Plant, it was necessary for the Service to consider the effects of all projects which reasonably can be expected to be completed and operational during the life of the project under consideration. The Department of Interior's Solicitor's opinion on cumulative effects was issued on July 19, 1978, and a copy is attached for your information. This opinion is based in part on the National Environmental Policy Act, and the need to take an ecosystem approach in dealing with environmental matters. Since dredging projects are ongoing and planned throughout the manatee's range, we feel it is appropriate to consider cumulative effects in regions where known concentrations of manatees occur. This is particularly important in view of past instances of manatee mortality associated with dredging projects in the Saturn Barge Channel at Kennedy Space Center and on the gulf coast in the Alafia River. After careful consideration of the information supplied by the Corps, EPA, and Florida Power Corporation, as well as taking into account manatee mortality data gathered by the Service, it is our Biological Opinion that the dredging to deepen the intake channel for the Crystal River Power Plant and activities associated with and resulting from this dredging are likely to jeopardize the continued existence of the manatee.

However, the likelihood of jeopardy would be precluded by the following reasonable and prudent alternatives:

1. Tugs and barges use minimum speeds necessary to maintain steerage while in the channel. Since the minimum width of the channel is to be 150 feet and the barge beam is 82 feet, there will be only about 34 feet on each side of the barge for manatees to pass. We understand that the design draft will be 18 feet. Since the channel will be 20 feet at mean low water, there might be insufficient clearance in most cases for the barge to safely pass over manatees. In connection with this provision, signs designating the channel as a manatee concentration area shall be placed at both ends of the channel. Tug and barge captains shall be instructed to use caution in the channel due to the presence of manatees.

2. The following stipulation shall be included in any permit issued for the construction of the project.

> The contractor will instruct all personnel associated with the construction of the project about the potential presence of manatees in the area. All vessels associated with the project shall operate at "no wake" speeds at all times while in shallow waters, or channels, where the draft of the boat provides less than three feet clearance of the bottom. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act. The contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the projects.

3. State and Federal water quality standards shall be strictly adhered to in order to prevent siltation on any manatee feeding area.

These same stipulations were put in our Biological Opinion to the Corps of Engineers on February 9, 1979. If modifications are made in the project or if additional facts involving the potential impact to the manatee or indigo snake arise, then consultation should be reinitiated. This Biological Opinion is intended to assist the Environmental Protection Agency in meeting its responsibilities under Section 7 of the amended Endangered Species Act.

Sincerely yours,

Regional Director

Attachment

Appendix D
Site Certification Conditions

BEFORE THE GOVERNOR AND CABINET
OF THE STATE OF FLORIDA

In the Matter of:

The application for Power Plant
Site Certification submitted by
Florida Power Corporation with
regard to its proposed Units No. 4
& 5 at Crystal River, Florida (DER
Case No. PA 77-09)

DOAH CASE NO.: 77-2212

The following persons were present and participated in the disposition of this matter:

Honorable Jesse J. McCrary
Secretary of State

Honorable Robert L. Shevin
Attorney General

Honorable Bill Gunter
Treasurer and Insurance Commissioner

Honorable Gerald A. Lewis
Comptroller

Honorable Doyle Conner
Commissioner of Agriculture

Honorable Ralph D. Turlington
Commissioner of Education

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CERTIFICATION ORDER

BY THE BOARD:

The Board, having heard presentations by the parties, having reviewed the Recommended Order dated October 18, 1978, (attached and incorporated as Exhibit I), as well as the conditions of certification referred to therein and attached thereto, having considered the exceptions submitted by the State of Florida, Department of Environmental Regulation and by the Southwest Florida Water Management District, and being otherwise fully advised herein, it is

ORDERED:

1. The last two sentences of the 15th paragraph on page 11 of the Hearing Officer's Findings of Fact, Conclusions of Law, and

Recommended Order are deleted. In their place and stead is substituted the following language:

> However, the evidence is insufficient to determine the significance of these combined affects. It is possible that there may or may not be significant injury to the environment, vegetation, or life forms in the vicinity of this site if such a system were employed by Florida Power Corporation.

2. Two typographical errors which appear in Condition VIII on page 15 of the Conditions of Certification attached to the Recommended Order are corrected as follows:

17-22.05 should read 17-22.108
17-23 should read 17-16

3. In all other regards, the Findings of Fact, Conclusions of Law, and Recommended Order are approved and adopted. The general and special conditions referenced therein and attached thereto are approved and adopted, and the certification of Crystal River Units 4 & 5 is made specifically subject to those conditions.

DONE AND ENTERED this 21st day of November, 1978, subsequent to a vote of the Board at a duly constituted Cabinet meeting of November 21, 1978.

FOR THE BOARD:

Reubin O'D. Askew
REUBIN O'D. ASKEW
Governor

VOTE: Unanimous in favor

Copies furnished to all parties

Sheri Smallen

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

RECEIVED
OCT 20 1978
Dept. of Environmental Regulation
Office of General Counsel

In re: Florida Power Corporation
Crystal River Units 4 & 5

CASE NO. 77-2212

FINDINGS OF FACT, CONCLUSIONS OF LAW AND RECOMMENDED ORDER

This proceeding was held pursuant to the Florida Electrical Power Plant Siting Act, Chapter 403, Part II, Florida Statutes, and Chapter 17-17, Florida Administrative Code, to consider Florida Power Corporation's application for site certification of two electrical generating facilities known as Crystal River Units 4 and 5 proposed for Citrus County, Florida.

The Governor and Cabinet, sitting as the Board under Chapter 403, Part II, Florida Statutes, entered an Order dated April 20, 1978, holding that the proposed site of Units 4 and 5 is consistent and in compliance with existing land use plans and zoning ordinances.

Pursuant to proper notice, (FPC Exhibit 1), a certification hearing as required by Section 403.508(3), Florida Statutes, was held in Crystal River, Florida, September 18, 19, and 20, 1978 for the purpose of receiving testimony and evidence concerning whether the location and operation of the proposed facilities will produce minimal adverse effects on human health, the environment, the ecology of the land and its wildlife, and the ecology of state waters and their aquatic life. The hearing included an examination of the following: the necessity for expanded electrical generation; the expected environmental impact from construction and operation of the facilities; operational safeguards of the facilities; the availability of abundant, low-cost electrical energy; and other public interests and issues relevant to certification of the proposed site. In addition, evidence relating to best available control technology (BACT) and the prevention of significant deterioration (PSD) was presented.

The following parties entered appearances at and/or participated in this proceeding through counsel:

1. Applicant, Florida Power Corporation;
2. Florida Department of Environmental Regulation;
3. Florida Public Service Commission;
4. Florida Department of Administration, Division of State Planning;
5. Southwest Florida Water Management District;
6. Florida Lung Association; and
7. Florida Audubon Society.

Only Florida Power Corporation, the Department of Environmental Regulation, the Public Service Commission, and the Southwest Florida Management District appeared at the hearing.

Florida Power Corporation requested that the Florida Department of Transportation be added as a party to this proceeding pursuant to Sections 403.508(4)(e) and 403.509(2), Florida Statutes, and Section 17-17.11(2)(e), Florida Administrative Code. The Department of Transportation had knowledge of Florida Power Corporation's intention to cross U. S. Highway 19/98 and, by its failure to appear in this proceeding and by written authorization acquiesced in and waived any right to oppose such crossing if approved by this certification.

All issues except the appropriate main steam condenser cooling water systems for the proposed facilities were settled by agreement of the parties at or before the certification hearing. Specifically remaining at issue at the certification hearing was whether the proposed facilities should be certified for the use of saltwater cooling towers or for the use of a saltwater once-through cooling system. Having considered all testimony and evidence properly admitted, having heard argument of counsel, and being otherwise fully apprised herein, the following Findings of Fact, Conclusions of Law, and Recommended Order are entered.

FINDINGS OF FACT

1. The proposed site of Units 4 and 5 is approximately 7 1/2 miles northwest of Crystal River, Florida. The site is situated between the mouths of the Withlacoochee and Crystal Rivers and is bordered on the west by the Gulf of Mexico and on the east by U. S. Highway 19/98. It is primarily composed of marshland in low-lying areas with a variety of scattered vegetation ranging from swampgrass to heavy woods. Pine and palmetto scrub predominate. The site is currently used by Florida Power Corporation to operate three electrical generating facilities designated as Units 1, 2 and 3. Unit 1 is a 440.5 MW oil-fired unit scheduled for conversion to coal in February, 1979. Unit 2 is a 523.8 MW

coal-fired unit. Unit 3 is a 855 MW nuclear unit with shared ownership. The total site for Crystal River Units 1 through 5 consists of 4,738 acres. It includes a 1/4 mile wide corridor running eastward to U. S. Highway 19/98 which is used for access road, railroad spur and transmission lines. A smaller corridor extends eastward of U. S. Highway 19/98 and contains railroad spur and transmission lines. The total cleared area for Units 1, 2 and 3 is approximately 319 acres.

2. Units 4 and 5, as proposed, are each a 640 MW coal-fired steam electric generating unit with related facilities. As envisioned, each unit will have a chimney approximately 600 feet tall. Each unit will have an electrostatic precipitator, for the purpose of controlling the emission of particulates, located in the flue gas duct work between the steam generator housing and the chimney for the unit. Each unit will also have natural draft saltwater cooling tower approximately 460 feet tall and about 370 feet in diameter at the base. Saltwater for makeup to the cooling towers will be withdrawn from the existing discharge canal and returned to the existing discharge canal as blowdown. The existing coal handling facility for Units 1 and 2 will be expanded and modified to accommodate the requirements of Units 4 and 5. New coal and ash storage areas will be established to serve Units 4 and 5. Directly associated facilities connected with Units 4 and 5 include a railroad spur, access road, sewage treatment plant, administration building, maintenance building, parking lots, freshwater well field, and well field pipeline. The freshwater well field will be located east of U. S. Highway 19/98 on the existing transmission line corridor. Ground water from this freshwater well field will

be used as plant service water only. None of the water from this well field is to be used in the main stream condenser units for power plant cooling purposes. Well water will be conveyed to Units 4 and 5 via a pipeline located on the existing transmission line corridor and crossing U. S. Highway 19/98. Units 4 and 5 will use the existing transmission line system; however, short electrical tie-lines will be necessary to connect Units 4 and 5 to the existing electrical substations located south of Units 4 and 5.

3. Units 4 and 5 will be needed for additional capacity by their projected startup dates of October, 1982, and April, 1984, respectively. Unless the proposed units are available for commercial operation by those dates, there may not be sufficient capacity within Florida Power Corporation's system or available for purchase from other utilities to meet projected demand. The Florida Public Service Commission's reports and testimony show that the construction and operation of Units 4 and 5 as scheduled are badly needed in order to avoid extremely low generating reserve margins and unacceptably high loss of load probabilities. The evidence supports a finding of need for these two units as scheduled. This evidence includes the following: (a) Florida Power Corporation's planned reserve margin for the projected 1982-1983 winter peak pursuant to its revised generation expansion plan would be 14.6 percent with Unit 4. Without Unit 4, the Company's reserve margin would be reduced to 3.3 percent or 185 MW, which is less than its current 208 MW spinning reserve obligation to the peninsular grid. (b) Florida Power Corporation's planned reserve margin for the projected 1984-1985 winter peak would be 13.1 percent with Unit 5. Without Unit 5,

this reserve level would be reduced to 2.6 percent or 155 MW, which is again less than the Company's current spinning reserve obligation to the peninsular grid. (c) Two of the proposed plants of other utilities from which Florida Power Corporation plans to purchase power in order to maintain the reserve levels indicated in (a) and (b) above have either not been constructed or are in various stages of licensing proceedings. They are thus subject to licensing and construction delays that might further reduce Florida Power Corporation's reserve margins and increase the likelihood of blackouts, power outages, and other interruptions of service to customers. (d) Generation planning, because of the long lead time to construct a generating unit, must be flexible. Loss of load probability data indicates that the State of Florida would be substantially reducing its flexibility if construction of Units 4 and 5 is not allowed to proceed at this time.

4. The construction of Units 4 and 5 and their related facilities will involve the loss of about 335 acres of vegetation and wildlife habitat. The proposed plant site has been shifted eastward from the initially proposed site in order to reduce the destruction of coastal salt marsh, coastal hammock, and coastal hydric hammock. The areawide effect of construction and operation on wildlife and vegetation is not expected to be significant because of the commonality of the affected species and the current abundance of available forest habitat in the area. Appropriate steps have been proposed to minimize the environmental impacts of construction and operation.

5. Due to the isolated nature of the proposed site for

Units 4 and 5, there is very little opportunity for public access during construction and operation. Vehicular traffic from U. S. Highway 19/98 to the east will be intercepted and controlled by a guard system, as will boat access via the existing intake and discharge canals from the Gulf of Mexico to the west. Florida Power Corporation has proposed adequate measures to comply with the federal Occupational Safety and Health Act and the Florida Workmen's Compensation Law, and to control fugitive dust during construction, the disposition of combustible materials by open burning, and turbidity and sedimentation from construction. Increased ambient noise levels resulting from construction activities will have no impact on the general public due to the remoteness of the plant site.

6. Units 4 and 5 will generate various process waste waters. None of those waste waters besides cooling tower blowdown will be discharged directly to surface waters except rainfall runoff in excess of the 10 year, 24 hour storm. The plant drains collection pond will receive many of these waste waters and will be designed to retain all inflows resulting from a 10 year, 24 hour storm. There will normally be no discharge from the plant drains collection pond. The pond will retain storm water for roughly 24 hours to remove floating materials prior to discharge into the cooling tower blowdown conduit. The runoff collection and retention system, which will receive surface runoff from the plant site, roof drains and material storage areas, will also be designed to contain all runoff from a 10 year, 24 hour storm. Overflow of the plant drains collection pond and the runoff and retention system which might occur

during storms exceeding the 10 year, 24 hour criterion, would discharge to the existing cooling water canals and thence to the Gulf of Mexico. The potential impacts of overflows upon aquatic ecosystems will be limited greatly by three factors: (1) the low frequency of occurrence, (2) the short duration of overflows, and (3) the large quantities of dilution waters available from existing Units 1, 2 and 3 when overflow occurs.

7. The application seeks certification for a 300,000 gallon per day sewage treatment facility. However the evidence establishes that, in fact, the applicant only needs a 10,000 gallon per day facility at present. Therefore, the request has been reduced to reflect the applicant's present need.

8. The proposed facilities also include various ditches, ponds, storage areas, and landfill sites for the collection and treatment of storm water runoff, chemical wastes, boiler blowdown, coal pile and ash landfill runoff and other wastes. A potential concern exists that rainfall and groundwater flow from such facilities may result in the leaching of polluting substances into groundwaters of the state. The conditions of certification include a leachate testing and monitoring program designed to study and eliminate this potential leachate concern, and to assure compliance with state water quality standards.

9. Cooling tower blowdown released to the discharge canal will be approximately 37,587 gallons per minute during peak conditions and 22,892 gallons per minute during normal operating conditions. This discharge will be diluted in the canal by a flow of 1,380,000 gallons per minute of sea water used in existing Units 1,

2 and 3 for once-through cooling. The ecological and thermal effects of cooling tower blowdown will be less detrimental and more environmentally acceptable than the effects anticipated from other cooling systems.

10. Florida Power Corporation and its consultants have studied various alternative strategies in order to prevent significant deterioration of air quality from the operation of Units 4 and 5. The studies show that the most economical strategy which will comply with state and federal regulations calls for the use of 99.6 percent efficient electrostatic precipitators, boiler design for the oxides of nitrogen, the burning of low sulfur coal in Units 4 and 5, and the reduction of sulfur content of coal to be burned in existing Units 1 and 2. The installation of flue gas scrubbers could cause several undesirable impacts, including reduction in reliability of the generating units, additional plant consumption of electrical energy, additional requirements for freshwater, additional requirements for land for sludge disposal, and the consumption of limestone with its attendant mining and handling environmental impacts. The evidence indicates that a sufficient supply of low sulfur coal will be available to Florida Power Corporation, which is required to further demonstrate such availability pursuant to the attached conditions of certification.

11. Florida Power Corporation and its consultants have modeled and analyzed the projected effect of the air pollution control strategy proposed for Units 4 and 5. The evidence developed from such studies shows that the operation of Units 4 and 5 as

proposed pursuant to the attached conditions of certification will comply with the state and federal standards for the prevention of significant deterioration of air quality. In addition, the evidence demonstrates that the strategy proposed by Florida Power Corporation and its consultants utilizes the best available control technology as required by state and federal regulations.

12. The proposed site for Units 4 and 5 is better than alternative sites which were studied because (a) it is the site of existing electrical generating units, (b) it will not necessitate the building of additional transmission lines, and (c) it is located near the Gulf of Mexico, which will provide a source of abundant low quality water for cooling purposes.

13. Florida Power Corporation proposes to use saltwater cooling towers as the main steam condenser cooling water systems for Units 4 and 5. The Company and its consultants also studied the suitability of cooling towers using freshwater from a variety of sources including a well field to be located on the transmission line corridor east of U. S. Highway 19/98, Lake Rousseau, and the Cross Florida Barge Canal, as well as a once-through saltwater cooling system that would comply with Florida's thermal pollution rule, Section 17-3.05(3)(d)(ii), Florida Administrative Code, and one that would not comply with that rule. All parties and commenting agencies have agreed that saltwater is more acceptable than freshwater for main steam condenser cooling at Units 4 and 5.

14. Physically, the site is compatible with the use of a once-through saltwater cooling system. Economically, a once-through saltwater system, achieving a fourteen degree (14°F) rise

in temperature, is significantly less expensive to construct and less expensive to operate than are saltwater cooling towers. However, the evidence establishes that a fourteen degree (14°F) rise, once-through saltwater system would exceed the thermal limits on discharges imposed by DER Rule 17-3.05, Florida Administrative Code. The federal Environmental Protection Agency has stated that once-through saltwater cooling would not be permitted for Units 4 and 5 at this site. Similarly, the Department of Environmental Regulation concluded in its staff analysis that once-through cooling would not be an acceptable alternative for Crystal River Units 4 and 5. The evidence indicates that once-through saltwater cooling which would comply with the applicable thermal pollution regulations is economically unacceptable at this site and that regulatory approval of once-through cooling could not be obtained in time to permit commercial operation by the scheduled dates.

15. The record indicates that construction and operation of an expanded once-through saltwater system at this site will cause loss or destruction of some forms of marine vegetation and some species of marine organisms in the vicinity, as a combined result of thermal effects, impingement, and entrainment. However, the evidence concerning the significance of these combined affects is conflicting and ambiguous. It is possible that there may be little or no significant injury to the environment, vegetation, or life forms in the vicinity of this site if such a system were employed by Florida Power Corporation.

16. The Southwest Florida Water Management District has stated that any conversion of saltwater cooling towers to the

use of freshwater would be unacceptable as a consumptive use of freshwater. Further, there has been no showing that adequate supplies of fresh water are available or suitable for main steam condenser cooling at this site.

17. In balancing all the variables, saltwater cooling towers are found to be the appropriate main steam condenser cooling water systems for Units 4 and 5.

18. Florida Power Corporation has requested variances from certain regulations of the Department of Environmental Regulation and the Southwest Florida Water Management District. By stipulation of those parties, the requests for variances can be resolved as follows:

a. The requests for variances from Sections 17-3.05(2), 17-7.05(3)(d), and 17-7.04(2)(f), Florida Administrative Code, relating to leachates from the coal and ash storage areas and the location of the ash storage area, can be resolved by implementation of the leachate testing and monitoring program as outlined in the attached conditions of certification.

b. The request for a variance from Section 17-3.05(2)(d), Florida Administrative Code, relating to turbidity, can be resolved by adoption of Special Condition XI attached.

c. The request for a variance from Section 17-4.28(8), Florida Administrative Code, relating to dredging in Class II waters is unnecessary because the proposed units will be located on Class III waters.

d. The request for a variance from Section 17-3.05(3)(d)(ii), Florida Administrative Code, relating to discharges of heated water, can be disposed of by the provision for a mixing zone contained in the conditions of certification attached.

e. The request for a variance from Section 16J-2.11 (3), Florida Administrative Code, is unnecessary because the Southwest Florida Water Management District has stipulated that its consumptive use water crop rule does not apply to the use of saltwater from the Gulf of Mexico and the variance request has been withdrawn.

f. The request for a variance from Section 16J-2.11(4) (e), Florida Administrative Code, relating to the lowering of the potentiometric surface, can be resolved with respect to the use of freshwater for purposes other than main steam condenser cooling by adoption of Special Conditions IIIA.-G. attached.

19. Unless the site of Crystal River Units 4 and 5 is certified as soon as possible, commencement of construction may be delayed and Florida Power Corporation may be required by applicable federal regulations to install expensive flue gas scrubbers (flue gas desulfurization equipment) at the proposed units. Such a requirement could result in higher cost electric power, reduced ability to deliver electric power to consumers, and potentially adverse environmental effects.

20. During and at the conclusion of the site certification hearing, the public was given the opportunity to comment upon the application for site certification. No public testimony was offered.

21. The Florida Department of Environmental Regulation,

the Public Service Commission, and the Division of State Planning have all recommended certification of Units 4 and 5 subject to conditions. The stipulated conditions are attached.

CONCLUSIONS OF LAW

22. This proceeding was held pursuant to the Florida Electrical Power Plant Siting Act, Chapter 403, Part II, Florida Statutes, and Chapter 17-17, Florida Administrative Code, to consider the subject application for site certification.

23. Notice, in accordance with Chapter 403 and Chapter 120, Florida Statutes, and Chapter 17-17, Florida Administrative Code, has been given to all persons and parties entitled thereto, as well as the general public.

24. The purpose of the site certification hearing was to receive testimony and evidence concerning whether the location and operation of the proposed facilities will produce minimal adverse effects on human health, the environment, the ecology of the land and its wildlife, and the ecology of state waters and their aquatic life and to fully balance the increasing demand for electric power plant location and operation with the broad interests of the public, as provided in Chapter 403, Florida Statutes.

25. The record of this hearing consists of all pleadings and papers filed herein, including the site certification application, as amended, the transcripts of all hearings, all orders entered by the Hearing Officer, and all evidence and exhibits properly admitted to the record.

26. Section 403.507(1)(a), Florida Statutes, provides

that the Division of State Planning shall present a report as to the compatibility of the proposed electrical power plant with any state comprehensive plan. The Division of State Planning has made a report on Units 4 and 5 and its report and recommendations have been submitted and introduced into evidence. The Division recommends the certification of proposed Units 4 and 5 subject to a condition which has been accepted by Florida Power Corporation.

27. Section 403.507(1)(b), Florida Statutes, requires that the Florida Public Service Commission shall prepare a report and recommendation as to the present and future needs for electrical generating capacity in the area to be served by the proposed site and shall submit its findings to the Department of Environmental Regulation. Such a report and recommendations have been submitted and introduced into evidence. The Public Service Commission recommends the certification of proposed Units 4 and 5.

28. Section 17-17.04(5), Florida Administrative Code, requires the water management district in whose jurisdiction Units 4 and 5 are proposed to be located to prepare a report of its position of the impact of the proposed facilities on the water resources of the district. The Southwest Florida Water Management District prepared such a report, which was submitted and introduced into evidence. The report approves the use of saltwater for the main steam condenser cooling systems of Units 4 and 5 and expresses the District's position that any later conversion from saltwater cooling towers to freshwater cooling towers would be an unacceptable use of the District's freshwater resources.

29. Section 403.507(2), Florida Statutes, requires that the Department of Environmental Regulation conduct, or contract for, studies of the proposed electrical power plant and site, including, but not limited to (a) cooling system requirements, (b) construction and operational safeguards, (c) proximity to transportation systems, (d) soil and foundation conditions, (e) impact on suitable present and projected water supplies for this and other competing uses, (f) impact on surrounding land uses, (g) accessibility to transmission corridors and (h) environmental impacts. Such a report and recommendations have been submitted and introduced into evidence. The Department of Environmental Regulation recommends certification of proposed Units 4 and 5, subject to the conditions of certification which are attached and have been accepted by Florida Power Corporation.

30. The location and operation of proposed Units 4 and 5, as described by the evidence admitted to the record, if made subject to the conditions of certification attached, are expected to produce minimal adverse effects on human health, the environment, the ecology of land and its wildlife and the ecology of state waters and their aquatic life.

31. The operational safeguards for proposed Units 4 and 5 are technically sufficient for the welfare and protection of the citizens of Florida.

32. The certification of proposed Units 4 and 5 is consonant with the premise of abundant, low-cost electrical energy.

33. Proposed Units 4 and 5, if certified pursuant to the conditions of certification attached, will comply with the

pertinent state and federal regulations concerning the prevention of significant deterioration of air quality (PSD), Section 17-2.04, Florida Administrative Code, and the application of the best available control technology (BACT), Section 17-2.03, Florida Administrative Code.

34. All requests for variances which have been filed by Florida Power Corporation in this cause are unnecessary or can be resolved by adoption, pursuant to Section 403.511(5)(a), Florida Statutes, of the conditions of certification attached.

35. Certification of proposed Units 4 and 5 will constitute permission for Florida Power Corporation to cross U. S. Highway 19/98 as proposed.

RECOMMENDED ORDER

Having reviewed the record of this proceeding, and based upon the findings of fact and conclusions of law set forth herein, it is hereby recommended that certification, pursuant to Chapter 403, Part II, Florida Statutes, be granted to Florida Power Corporation for the construction and operation of Crystal River Units 4 and 5, the associated facilities and the directly associated transmission lines, as proposed in the amended application and evidence admitted to the record. It is further recommended that the certification be made subject to the conditions of certification attached.

DONE and ORDERED this 18 day of October, 1978, in Tallahassee, Florida.

Chris H. Bentley
CHRIS H. BENTLEY
Hearing Officer
Division of Administrative Hearings
101 Collins Building
Mail: 530 Carlton Building
Tallahassee, Florida 32304
(904) 488-9675

Copy furnished:

Sheri W. Smallwood, Esquire
Department of Environmental Regulation
2600 Blairstone Road
Tallahassee, Florida 32304

Barrett G. Johnson, Esquire
Public Service Commission
101 E. Gaines Street Room 206
Tallahassee, Florida 32304

L. M. Blain, Esquire and
Thomas E. Cone, Esquire
P. O. Box 399
Tampa, Florida 33601

David Gluckman, Esquire
Florida Lung Association and
Florida Audubon Society
5305 Isabelle Drive
Tallahassee, Florida 32301

C. Laurence Keesey, Esquire
Division of State Planning
530 Carlton Building
Tallahassee, Florida 32304

Wade L. Hopping, Esquire and
Gary P. Sams, Esquire
Mahoney, Hadlow & Adams
P. O. Box 5617
Tallahassee, Florida 32301

State of Florida Department of Environmental Regulation
Florida Power Corporation
Crystal River Units No. 4 & 5
Case No. PA 77-09
CONDITIONS OF CERTIFICATION

GENERAL

1. Change in Discharge

All discharges or emissions authorized herein shall be consistent with the terms and conditions of this certification. The discharge of any pollutant not identified in the application, or any discharge more frequent than, or at a level in excess of that authorized herein, shall constitute a violation of the certification. Any anticipated facility expansions, production increases, or process modifications which will result in new, different or increased discharges or expansion in steam generating capacity will require a submission of a new or supplemental application pursuant to Chapter 403, Florida Statutes.

2. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any limitation specified in this certification, the permittee shall notify the Southwest District Manager of the Department by telephone during the working day during which said noncompliance occurs and shall confirm this situation in writing within seventy-two (72) hours of first becoming aware of such conditions, supplying the following information:

a. A description and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying event.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this certification. Such systems are not to be bypassed without prior department approval.

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4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact resulting from noncompliance with any limitation specified in this certification, including but not limited to such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying event.

5. Right of Entry

The permittee shall allow the Secretary of the Florida Department of Environmental Regulation and/or authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which records are required to be kept under the terms and conditions of this permit; and

b. To have access to and copy all records required to be kept under the conditions of this certification; and

c. To inspect and test any monitoring equipment or monitoring method required in this certification and to sample any discharge or pollutants, and

d. To assess any damage to the environment or violation of ambient standards.

6. Revocation or Suspension

This certification may be suspended or revoked pursuant to Section 403.512, Florida Statutes, or for violations of any General or Special Condition.

7. Civil and Criminal Liability

This certification does not relieve the permittee from civil or criminal responsibility or liability for noncompliance with any conditions of this certification, applicable rules or regulations of the Department, or Chapter 403, Florida Statutes, or regulations thereunder.

Subject to Section 403.511, Florida Statutes, this certification shall not preclude the institution of any legal action or relieve the permittee from any responsibilities or penalties established pursuant to any other applicable State Statutes or regulations.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact resulting from noncompliance with any limitation specified in this certification, including but not limited to such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying event.

5. Right of Entry

The permittee shall allow the Secretary of the Florida Department of Environmental Regulation and/or authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which records are required to be kept under the terms and conditions of this permit; and

b. To have access to and copy all records required to be kept under the conditions of this certification; and

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This certification may be suspended or revoked pursuant to Section 403.512, Florida Statutes, or for violations of any General or Special Condition.

7. Civil and Criminal Liability

This certification does not relieve the permittee from civil or criminal responsibility or liability for noncompliance with any conditions of this certification, applicable rules or regulations of the Department, or Chapter 403, Florida Statutes, or regulations thereunder.

Subject to Section 403.511, Florida Statutes, this certification shall not preclude the institution of any legal action or relieve the permittee from any responsibilities or penalties established pursuant to any other applicable State Statutes or regulations.

8. Property Rights

The issuance of this certification does not convey any property rights in either real or personal property tangible or intangible, nor any exclusive privileges, nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. The applicant will obtain title, lease or right of use from the State of Florida, to any sovereign submerged lands occupied by plant, transmission line structures, or appurtenant facilities.

9. Severability

The provisions of this certification are severable, and if any provision of this certification, or the application of any provision of this certification to any circumstances, is held invalid, the application of such provision to other circumstances and the remainder of the certification shall not be affected thereby.

10. Definitions

The meaning of terms used herein shall be governed by the definitions contained in Chapter 403, Florida Statutes, and any regulation adopted pursuant thereto. In the event of any dispute over the meaning of a term used in these general or special conditions which is not defined in such statutes or regulations, such dispute shall be resolved by reference to the most relevant definitions contained in any other state or federal statute or regulation or, in the alternative by the use of the commonly accepted meaning as determined by the Department.

11. Review of Site Certification

The certification shall be final unless revised, revoked or suspended pursuant to law. At least every five years from the date of issuance of this certification or any National Pollutant Discharge Elimination System Permit issued pursuant to the Federal Water Pollution Control Act Amendments of 1972, for the plant units, the Department shall review all monitoring data that has been submitted to it during the preceding five-year period, for the purposes of determining the extent of the permittee's compliance with the conditions of this certification and the environmental impact of this facility. The Department shall submit the results of its review and recommendations to the permittee. Such review will be repeated at least every five years thereafter.

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12. Modification of Conditions

The conditions of this certification may be modified in the following manner:

a. The Board hereby delegates to the Secretary the authority to modify, after notice and opportunity for hearing, any conditions pertaining to monitoring, sampling, or groundwater.

b. All other modifications shall be made in accordance with Section 403.516, F.S.

State of Florida Department of Environmental Regulat
Florida Power Corporation
Crystal River Units No. 4 & 5
Case No. PA 77-09
CONDITIONS OF CERTIFICATION (Revised 9/18/78)

SPECIAL

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State of Florida Department of Environmental Regulation
Florida Power Corporation
Crystal River Units No. 4 & 5
Case No. PA 77-09
CONDITIONS OF CERTIFICATION

SPECIAL

I. Air

The Construction and operation of Units No. 4 and 5 at the Crystal River steam electric power plant site shall be in accordance with all applicable provisions of Chapters 17-2, 17-5 and 17-7, Florida Administrative Code. In addition to the foregoing, the permittee shall comply with the following specific conditions of certification:

A. Emission Limitations

1. Stack emissions from Units 4 and 5 shall not exceed the following when burning coal:

   a. SO_2 - 1.2 lb. per million BTU heat input, maximum two hour average.

   b. No_x - 0.70 lb. per million BTU heat input.

2. Stack SO_2 emissions from Units 1 & 2 shall not exceed the following when coal is burned.

   a. Starting six months prior to the operation of Unit 4 - 2.9 lb per Million BTU heat input.

   b. Starting six months prior to the operation of Unit 5 - 2.1 lb per million BTU heat input.

3. The permittee shall not burn a fuel oil containing more than 0.73% sulfur. However, the applicant may petition the Department to revise this condition by (a) demonstrating compliance with Section 17-2.05(6)(e)1, FAC, or (b) installing a flue gas desulfurization unit that will insure compliance with the above emission limitation. The boiler shall not be operated unless this condition is complied with.

4. The height of the boiler exhaust stacks for Units No. 4 & 5 shall not be less than 600 ft. above grade.

5. The permittee shall provide a plot plan of equipment prior to the start of construction, showing the proposed tentative location of flue gas desulfurization (FGD) equipment

that such equipment can be added at a later date, if installation of such equipment should subsequently become necessary. Prior to installation of any FGD equipment, plans and specifications for such equipment shall be submitted to the Department for review and approval.

6. Particulate emissions from the coal handling facilities:

   a. The applicant shall not cause to be discharged into the atmosphere from any coal processing or conveying equipment, coal storage system or coal transfer and loading system processing coal, visible emissions which exceed 20 percent opacity.

   b. The applicant must submit to the Department within five (5) working days after it becomes available, copies of technical data pertaining to the selected particulate emissions control for the coal handling facility. These data should include, but not be limited to, guaranteed efficiency and emission rates, and major design parameters such as air/cloth ratio and flow rate. The Department may, upon review of these data, disapprove the use of such device if the Department determines the selected control device to be inadequate to meet the visible emission limit specified in 6(a) above.

B. Air Monitoring Program

1. The permittee shall install and operate continuously monitoring devices for the units No. 4 & 5 boiler exhaust for sulfur dioxide, nitrogen dioxide and opacity. The monitoring devices shall meet the applicable requirements of Section 17-2.08, FAC.

2. The permittee shall operate the existing ambient monitoring devices for sulfur dioxide as shown on Attachment 1, in accordance with EPA reference methods in 40 CFR, Part 53 and the existing ambient monitoring devices for suspended particulates as shown on Attachment 1. New or existing monitoring devices shall be located as designated by the Department. The frequency of operation shall be every six days as specified by the Department.

3. The permittee shall maintain a daily log of the amounts and types of fuels used and copies of fuel analyses containing information on sulfur content, ash content and heating values to facilitate calculations of emissions.

4. The permittee shall provide sampling ports into the stack and shall provide access to the sampling ports, in accordance

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DER Publication, Standard Sa[illegible]ing Techniques and Methods o[illegible] Analysis for the Determination of Air Pollutants from Point Source, July 1975.

5. The ambient monitoring program may be reviewed annually beginning two years after start-up of Unit No. 5 by the Department and the permittee.

6. Prior to operation of the source, the applicant shall submit to the Department a standardized plan or procedure that will allow the applicant to monitor emission control equipment efficiency and enable the applicant to return malfunctioning equipment to proper operation as expeditiously as possible.

7. Salt drift deposition, accumulation, vegetative effects and effects on equipment shall be monitored and reported to the department in a manner and frequency approved by the department prior to the operation of the first cooling tower.

C. Stack Testing:

1. Within 60 calendar days after achieving the maximum capacity at which each unit will be operated, but no later than 180 operating days after initial startup, the owner or operator shall conduct performance tests for particulates and SO_2 and furnish the Department a written report of the results of such performance tests.

2. Performance tests shall be conducted and data reduced in accordance with methods and procedures in accordance with DER's Standard Sampling Techniques and Methods of Analysis for Determination on Air Pollutants om Point Sources, July 1975.

3. Performance tests shall be conducted under such conditions as the Department shall specify based on representative performance of the facility. The owner or operator shall make available to the Department such records as may be necessary to determine the conditions of the performance tests.

4. The owner or operator shall provide 30 days prior notice of the performance tests to afford Department the opportunity to have an observer present.

5. Stack tests for particulates and SO_2 shall be performed annually in accordance with conditions C. 2, 3, and 4 above.

D. Reporting

1. For each Unit, stack monitoring, fuel usage and fuel analysis data shall be reported to the Department on a quarterly basis commencing with the start of commercial operation in accordance with 40 CFR, Part 60, Section 60.7., and in accordance with Section 17-2.08, FAC.

2. Ambient air monitoring data shall be reported to the Department quarterly commencing on the date of certification by the last day of the month following the quarterly reporting period utilizing the SAROAD or other format approved by the Department in writing.

E. Coal Characteristics and Contracts

Before approval can be granted by the Department for use of control devices, characteristics of the coal to be fired must be known. Therefore, before these approvals are granted, the applicant must submit to the Department copies of coal contracts which should include the expected sulfur content, ash content, and heat content of the coal to be fired. These data will be used by the Department in its evaluation of the adequacy of the control devices. Also, the applicant must demonstrate the ability to acquire a low sulfur coal supply of sufficient length to enable the installation of sulfur removal equipment if the supplies of low sulfur coal should not become available or be discontinued. Therefore, the coal contracts must be for a period of at least five (5) years from the date of start-up of the boiler.

F. Coal Information

As an alternative to the submittal of contracts for purchase of coal under condition E above, the applicant may submit the following information:

1. The name of the coal supplier;
2. The sulfur content, ash content, and heat content of the coal as specified in the purchase contracts;
3. The location of the coal deposits covered by the contract (including mine name and seam);
4. The date by which the first delivery of coal will be made;
5. The duration of the contract; and
6. An opinion of counsel for the applicant that the contracts are legally binding.

G. Reporting:

Beginning one month after certification the applicant shall submit to the Department a quarterly status report briefly outlining progress made on engineering design and purchase of major pieces of equipment (including control equipment). All reports and information required to be submitted under this condition shall be submitted to the Administrator of Power Plant Siting, Department of Environmental Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32301.

II. Water Discharges

Any discharges into any waters of the State during construction and operation of Units No. 4 & 5 shall be in accordance with all applicable provisions of Chapter 17-3, Florida Administrative Code and 40 CFR, 423, Effluent Guidelines and Standards for Steam Electric Power Generating Point Source Category. Also the permittee shall comply with the following conditions of certification:

A. Plant Effluents and Receiving Body of Water

For discharges made from the power plant the following conditions would apply.

1. Receiving Body of Water (RBW)

The receiving body of water will be determined by the Department to be those waters affected which are considered to be waters of the State within the definition of Chapter 403, Florida Statutes.

2. Point of Discharge (P.O.D.)

The point of discharge will be determined by the Department to be where the effluent physically enters the waters of the State.

3. Thermal Mixing Zone

The zone of thermal mixing for cooling tower blowdown shall not extend beyond the western end of the north bank of the existing discharge canal. During Discharge, the blowdown from the cooling tower for Units No. 4 & 5 shall be withdrawn at the point of lowest temperature of the recirculating cooling water prior to the addition of makeup water. The temperature at the point of discharge into the discharge canal shall not be greater than 95 degrees F. The temperature of the water at the end of the discharge canal shall not exceed the limitations of Paragraph 17-3.05(3)(d) when only Units 4 & 5 are operating and one or more of the circulating water pumps from the existing units are operating.

4. Chemical Wastes and Boiler Blowdown

All discharges of low volume wastes (demineralizer regeneration, cooling tower basin cleaning wastes, floor drainage, sample drains and similar wastes), metal cleaning wastes (including preheater and fireside wash) and boiler blowdown shall comply with Chapter 17-3. If violations of Chapter 17-3 occur, corrective action shall be taken. These wastewaters shall be discharged to an adequately sized and constructed percolation pond.

5. Coal Pile and Ash Landfill Runoff

Coal pile runoff and ash landfill runoff from less than 10-year 24-hour rainfall shall be treated if required by Special Condition III. H. and discharged to an adequately sized and constructed percolation ditch system.

6. Cooling Tower Blowdown

The cooling tower blowdown shall contain no detectable amounts of materials added for corrosion inhibition, including but not limited to zinc and chromium.

7. Chlorine

The quantity of free available chlorine discharged in the blowdown from the cooling tower shall not exceed 0.5 mg/l at any one time and shall not exceed 0.2 mg/l as an average. Neither free available chlorine nor total residual chlorine may be discharged from either unit for more than two hours in any one day and Units 4 or 5 may not discharge chlorine while any other unit is discharging chlorine.

8. pH

The pH of all discharges shall be such that the pH of water in the discharge canal shall be within the range of 6.0 to 8.5, at a distance of 150 meters from the POD into the canal.

9. Polychlorinated Biphenyl Compounds

There shall be no discharge of polychlorinated biphenyl compounds.

B. Water Monitoring Programs

The permittee shall monitor and report to the Department the listed parameters on the basis specified herein. The methods and procedures utilized shall receive written approval by the Department. The monitoring program may be reviewed annually by the Department, and a determination may be made as to the necessity and extent of continuation, and may be modified in accordance with condition No. 12 of the General Conditions of Certification.

1. Chemical Monitoring

The following parameters shall be monitored as shown during discharge commencing with the start of commercial operation of the first unit and reported quarterly to the Department:

Parameter	Location	Sample Type	Frequency
Flow, Groundwater	Wellfield pipeline	Recorder	Totalizer
Flow, Discharge	C.T. Outfall*	Recorder	Totalizer
Conductivity	C.T. Outfall	Recorder	Continuous
pH	C.T. Outfall	Multiple Grab**	Daily
Temperature	C.T. Outfall	Recorder	Continuous
TDS	C.T. Outfall	Grab	Weekly
Chlorine, Free Residual	C.T. Outfall	Multiple Grab**	During Discharge
Chlorine, Total	C.T. Outfall	Recorder	During Discharge
Oil and Grease	C.T. Outfall	Grab	During Discharge

2. Groundwater Monitoring

a. The groundwater levels shall be monitored continuously at wells as approved by Southwest Florida Water Management District. Chemical analyses shall be made on samples from all monitored wells identified in Condition III. F. below. The location, frequency and selected chemical analyses shall be as given in Condition III. F.

b. The groundwater monitoring program shall be implemented at least one year prior to operation of Crystal River No. 4. The chemical analyses shall be in accord with the latest edition of Standard Methods for the Analysis of Water and Wastewater. The data shall be submitted within 30 days of collection/analysis to the Southwest Florida Water Management District and to the DER Southwest District Office.

c. Conductivity and heavy metals shall be monitored in wells around all ash disposal sites and coal piles.

III. Groundwater

A. General

The use of groundwater from a linear wellfield for plant service water for Units 4 and 5 shall be minimized to the greatest extent practicable, but in no case shall exceed 3 mgd on a maximum daily basis from any new wells or 1.0 mgd on an average annual basis.

B. Well Criteria

The submission of well logs and test results and location, design and constructon of wells to provide plant service water shall be in accordance with applicable rules of the Department of Environmental Regulation and the Southwest Florida Water Management District (SWFWMD). Total water use per month shall be reported quarterly to SWFWMD commencing with the start of construction.

* Cooling Tower Outfall Pipe.
** Representative sample.

*C. Well Withdrawal Limits

FPC is authorized to make a combined average annual withdrawal of 1,000,000 gallons of water per day with a maximum combined withdrawal rate not to exceed 3,000,000 gallons during a single day. Withdrawals may be made from a linear wellfield consisting of up to twenty-one (21) wells whose locations are prescribed in the table below.

FPC Well No.	WITHDRAWAL POINT LATITUDE	WITHDRAWAL POINT LONGITUDE	GALLONS PER DAY MAXIMUM	GALLONS PER DAY AVERAGE
A	28 57 36	82 37 48	144,000	50,000
B	28 57 36	82 37 42	144,000	50,000
C	28 57 36	82 37 36	144,000	50,000
D	28 57 36	82 37 30	144,000	50,000
E	28 57 36	82 37 24	144,000	50,000
F	28 57 36	82 37 18	144,000	50,000
G	28 57 36	82 37 13	144,000	50,000
H	28 57 37	82 37 07	144,000	50,000
I	28 57 37	82 37 01	144,000	50,000
J	28 57 37	82 36 56	144,000	50,000
K	28 57 37	82 36 51	144,000	50,000
L	28 57 37	82 36 46	144,000	50,000
M	28 57 37	82 36 40	144,000	50,000
N	28 57 44	82 36 35	144,000	50,000
O	28 57 44	82 36 29	144,000	50,000
P	28 57 44	82 36 24	144,000	50,000
Q	28 57 44	82 36 18	144,000	50,000
R	28 57 44	82 36 13	144,000	50,000
S	28 57 44	82 36 07	144,000	50,000
T	28 57 45	82 36 01	144,000	50,000
U	28 57 45	82 35 56	144,000	50,000
	Combined Maximum:		3,000,000	1,000,000

After wells have been constructed, Southwest Florida Water Management District will evaluate the individual wells and may recommend to the Department authorization of increased withdrawals based upon hydrologic characteristics for the individual wells provided that the provisions of rules of the District relating to drawdown at the boundary of the property shall be observed. The Department pursuant to Section 403.516, F.S. may modify the above withdrawal limitations with the concurrence of SWFWMD.

D. Water Use Restriction

Said water is restricted to uses other than main steam condensing. Any change in the use of said water will require a modification of this condition.

*Revised 9/14/78

E. Emergency Shortages

In the event an emergency water shortage should be declared pursuant to Section 373.175 or 373.246, F.S., by Southwest Florida Water Management District for an area including the location of these withdrawal points, the Department pursuant to Section 403.516, F.S., may alter, modify, or declare to be inactive, all or parts of Special Condition III.A.-G. An authorized Water Management District Representative, at any reasonable time, may enter the property to inspect the facilities.

F. Monitoring and Reporting

FPC shall, within the time limits hereinafter set forth, complete the following items, and if it fails to complete them by the specified time, then Special Condition III.A.-G. shall automatically become null and void.

1. FPC shall install propellor driven flow meters in compliance with SWFWMD specifications on all production wells.

   Said meter shall be installed prior to commencement of withdrawal.

2. FPC shall submit to SWFWMD, on forms available from the District, a record of pumpage for each meter installed in F.1. above. Said pumpage shall be provided on a monthly basis, and shall be submitted by April 15, July 15, October 15, and January 15 for each preceding calendar quarter. Reports will be sent to:

   Chief, Technical Information Service
   Southwest Florida Water Management District
   5060 U.S. Highway 41, South
   Brooksville, Florida 33512

3. FPC shall maintain and operate continuous water level recorders on wells SMW-1, MZ-1, and WT-1 located at Florida Power Corporation pump test site in Citrus County, Florida. Water levels shall be monitored only in the deep zone MZ-1D of well MZ-1. FPC shall construct an additional monitor well similar to MZ-1, with any construction modifications approved by the SWFWMD staff, to be located within its right-of-way near U.S. Highway 19. Such additional monitor well shall be designated as MZ-2 and FPC shall maintain and operate continuous water level recorders to monitor the intermediate zone MZ-2I and the deep zone MZ-2D of well MZ-2. Detailed hydrographs of water level fluctuations shall be constructed with the data collected from the water level recorders and shall be submitted to SWFWMD by April 15, July 15, October 15, and January 15 for each preceding calendar quarter.

4. Water quality analysis shall be performed on water withdrawn from each production well and from the shallow (MZ-1S and MZ-2S), intermediate (MZ-1I and MZ-2I), and deep (MZ-1D and MZ-SD) zones in Monitor Wells MZ-1 and MZ-2. Water withdrawn from MZ-1S and MZ-2S shall be supplied from that portion of the Floridan Aquifer between 60' and 245' below land surface. Water withdrawn from wells MZ-1I and MZ-2I shall be supplied from that portion of the Floridan Aquifer between 360' and 373' below land surface. Water withdrawn from well MZ-1D and MZ-2D shall be from that portion of the Floridan Aquifer between 472' and 488' below land surface. The water samples collected from each of the referenced wells shall be collected immediately after removal by pumping of a quantity of water equal to two casing volumes. As monitor well MZ-2 is being constructed the FPC and staff of SWFWMD may determine and adjust the intervals to be monitored in accordance with hydrologic conditions determined from drilling logs. The water quality analyses shall be performed monthly during the first year of operation, four times (January, May, September and December) during the second year and twice each year (May and September) thereafter. Results shall be submitted to SWFWMD by the fifteenth (15th) day of the month following the month during which such analyses were performed. Testing for the following constituents is required:

   Calcium
   Potassium
   Chloride
   Specific Conductance
   Radium 226 (only if gross Alpha is greater than 15 pci/l)
   Magnesium
   Bicarbonate
   Nitrate
   Gross Alpha Radiation
   Sodium
   Sulfate
   Total Dissolved Solids
   Total Phosphate

   The design and location of wells MZ-1 and MZ-2 shall be as indicated by the attached Figures 1 and 2 respectively or as modified by the staff of SWFWMD.

5. In the event that SWFWMD determines there is a significant change in the water quality, the Department pursuant to Section 403.516, F.S., may require the permittee to reduce or cease withdrawal from these groundwater sources.

G. Minimum Water Level Restrictions

The Department and SWFWMD may, at a future date pursuant to Section 403.516, F.S., establish a minimum water level in the aquifer or aquifers hydrologically associated with these withdrawals, which may require FPC to reduce or cease withdrawal from these groundwater sources at times when water levels fall below these minimums.

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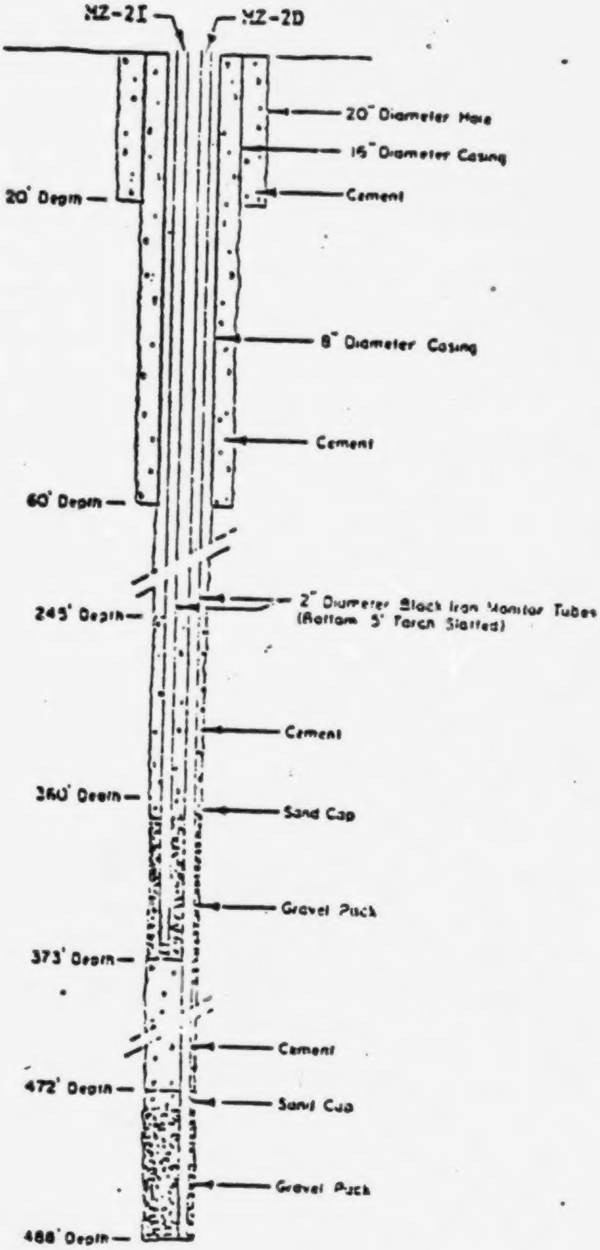
MZ-2I
MZ-2D
20" Diameter Hole
15" Diameter Casing
Cement
20' Depth
8" Diameter Casing
Cement
60' Depth
2" Diameter Black Iron Monitor Tubes
(Bottom 5' Torch Slotted)
245' Depth
Cement
360' Depth
Sand Cap
Gravel Pack
373' Depth
Cement
472' Depth
Sand Cap
Gravel Pack
488' Depth

Figure 1. Construction Diagram of Monitor Well MZ-2.

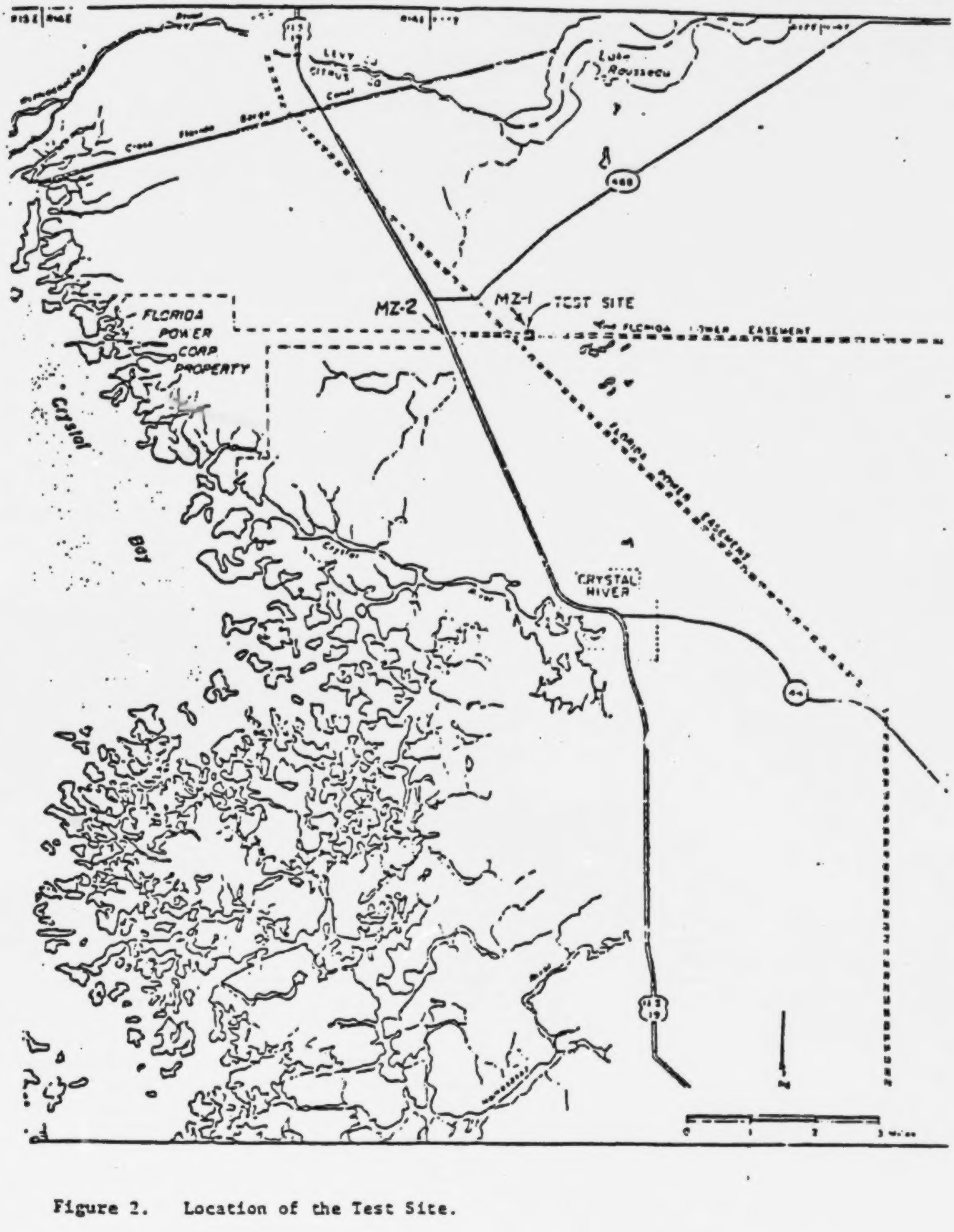
Levy Co
Citrus Co
Lake Rousseau
Cross Florida Barge Canal
US 19
488
MZ-2
MZ-1
TEST SITE
FLORIDA POWER CORP PROPERTY
Florida Power Easement
Crystal Bay
Crystal River
CRYSTAL RIVER
44
US 19
0
1
2
3 Miles

Figure 2. Location of the Test Site.

H. Leach

1. Compliance

Leachate from the ash landfill, coal storage piles, plant drains collection pond, canal retention system and ditches shall not contaminate waters of the State (including both surface and groundwaters) in excess of the limitations of Chapter 17-3, FAC.

2. Monitoring

A monitoring well system shall be used, commencing with operation, to determine whether or not leachate from the plant drains collection pond, canals, ditches, the ash landfill and coal pile is contaminating the groundwater in violation of Chapter 17-3. The permittee shall keep a monthly record of the monitoring results and shall notify the Southwest District Office of the Department and the Southwest Florida Water Management District when said measurements exceed water quality standards. A quarterly summary of the results of monitoring shall be provided to the Southwest District Manager. The proposed monitoring well system shall be submitted to the Department for approval prior to installation.

3. Corrective Action

When the leachate monitoring system indicates to the Department violation of the groundwater water quality standards of Chapter 17-3, FAC., the appropriate ditches, canal, pond, ash landfill, or coal pile shall be sealed, relocated or closed, or the operation of the affected facility shall be altered in such a manner as to assure the Department that no significant contamination of the groundwater will occur.

IV. Control Measures During Construction

A. Stormwater Runoff

During construction and plant operation, necessary measures shall be used to settle, filter, treat or absorb silt containing or pollutant laden stormwater runoff to limit the suspended solids to 50 mg/l or less at the POD during rainfall periods less than the 10-year, 24-hour rainfall, and to prevent an increase in turbidity to more than 50 Jackson Turbidity Units above background in waters of the State.

Control measures shall consist at the minimum, of filters, sediment traps, barriers, berms or vegetative planting. Exposed or disturbed soil shall be protected as soon as possible to minimize silt and sediment laden runoff. The pH shall be kept within the range of 6.0 to 8.5, after opportunity for reasonable mixing as defined in II.A.8.

B. Sanitary Wastes

Disposal of sanitary wastes from construction toilet facilities shall be in accordance with applicable regulations of the Department and appropriate local health agency. The sewage treatment plant shall be operated in accordance with Chapters 17-3, 17-16, and 17-19, FAC.

C. Environmental Control Program

An environmental control program shall be established under the supervision of a qualified person to assure that all construction activities conform to good environmental practices and the applicable conditions of certification.

The permittee shall notify the Department if unexpected harmful effects or evidence of irreversible environmental damage are detected during construction, shall immediately cease work and shall provide an analysis of the problem and a plan to eliminate or significantly reduce the harmful effects or damage, and to prevent reoccurrence.

V. Solid Wastes

Solid wastes resulting from construction or operation shall be disposed of in accordance with the applicable regulations of Chapter 17-7, FAC.

Open burning in connection with land clearing shall be in accordance with Chapter 17-5, FAC, no additional permits shall be required, but the Division of Forestry shall be notified prior to burning. Open burning shall not occur if the Division of Forestry has issued a ban on burning due to fire hazard conditions.

VI. Operation Safeguards

The overall design, layout, and operation of the facilities shall be such as to minimize hazards to humans and the environment. Security control measures shall be utilized to prevent exposure of the public to hazardous conditions.

VII. Screening

The permittee shall provide screening of the site through the use of aesthetically acceptable structures, vegetated earthen walls and/or existing or planted vegetation.

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VIII. Potable Water Supply System

The potable water supply system shall be designed and operated in conformance with Chapter 17-22, FAC. Information as required in 17-22.05 shall be submitted to the Department prior to construction and operation. The operator of the potable water supply system shall be certified in accordance with Chapter 17-23, FAC.

IX. Transformer and Electric Switching Gear

The foundations for transformers, capacitors, and switching gear necessary for Crystal River Units 4 and 5 to the existing distribution system shall be constructed of an impervious material and shall be constructed in such a manner to allow complete collection and recovery of any spills or leakage of oily, toxic, or hazardous substances.

X. Toxic, Deleterious, or Hazardous Materials

The spill of any toxic, deleterious, or hazardous materials shall be reported in the manner specified by General Conditions 2.

XI. Construction in Waters of the State

No construction on sovereignty submerged lands shall commence without obtaining lease or title from the Department of Natural Resources.

Construction of intake and discharge structures should be done in a manner to minimize turbidity. Sheetpiles or turbidity screens should be used if necessary to prevent turbidity in excess of 50 JTU above background beyond 150 meters from the POD and/or construction site.

XII. Ash Landfill and Coal Piles

*A. Ash Landfill

FPC shall designate a portion of the site as a temporary ash landfill. Associated with the temporary landfill shall be certain sites for the testing and monitoring of leachates and ash pile liners.

Adequate geophysical testing shall be conducted to determine if solution cavities are present under the landfill area. If such cavities are located, such cavities shall be sealed off and stabilized.

The proposed ash landfill area shall be monitored and studied pursuant to a detailed leachate testing and monitoring program to be submitted by FPC to the Department within 30

*Revised (9/14/78)

d of certification for review, and approval, rejection, or modification within 60 days thereafter. The detailed leachate testing and monitoring program shall be consistent with the conceptual leachate monitoring program attached and incorporated herein as Attachment 2.

After approval of the program by the Department, FPC shall conduct the approved testing and monitoring program under the supervision of the Department. Results of the program shall be submitted to the Department for its review and consideration on a monthly basis.

The results of the program will be used by the Department in determining whether FPC has affirmatively demonstrated that Florida Water Quality Standards (17-3 F.A.C) will not be violated, in determining the zone of discharge, and in determining the need for a liner.

If the Department determines that FPC has failed to affirmatively demonstrate that Florida Water Quality Standards (17-3 F.A.C.) will not be violated, FPC shall present to the Department, within 90 days of such determination, a plan of correction, (which may include, if appropriate, a semi-permeable liner) for review and approval by the Department, and for timely implementation by FPC; or FPC shall place an impermeable liner under the final ash landfill site and shall remove all ash from the temporary landfill site and place it on the lined landfill location.

The final cover shall be in compliance with Chapter 17-7, F.A.C., and at least 12" of clay or sufficient suitable liner material shall be placed on the top and exposed sides of each finished landfill cell. Sufficient topsoil to support vegetation shall be placed over the top and side clay liner. The top and exposed sides of the ash landfill shall be vegetated to control erosion.

B. Coal Pile

At least two feet of compacted clay, with characteristics similar to montmorillonite, shall be placed underneath any coal pile containing more than 0.2% pyritic sulfur.

XIII. Floodproofing

The power generation equipment and other facilities vital to the operation of the plant shall be constructed in such a manner that water elevations at the 100 year flood will not cause damage to the equipment or necessitate plant shutdown.

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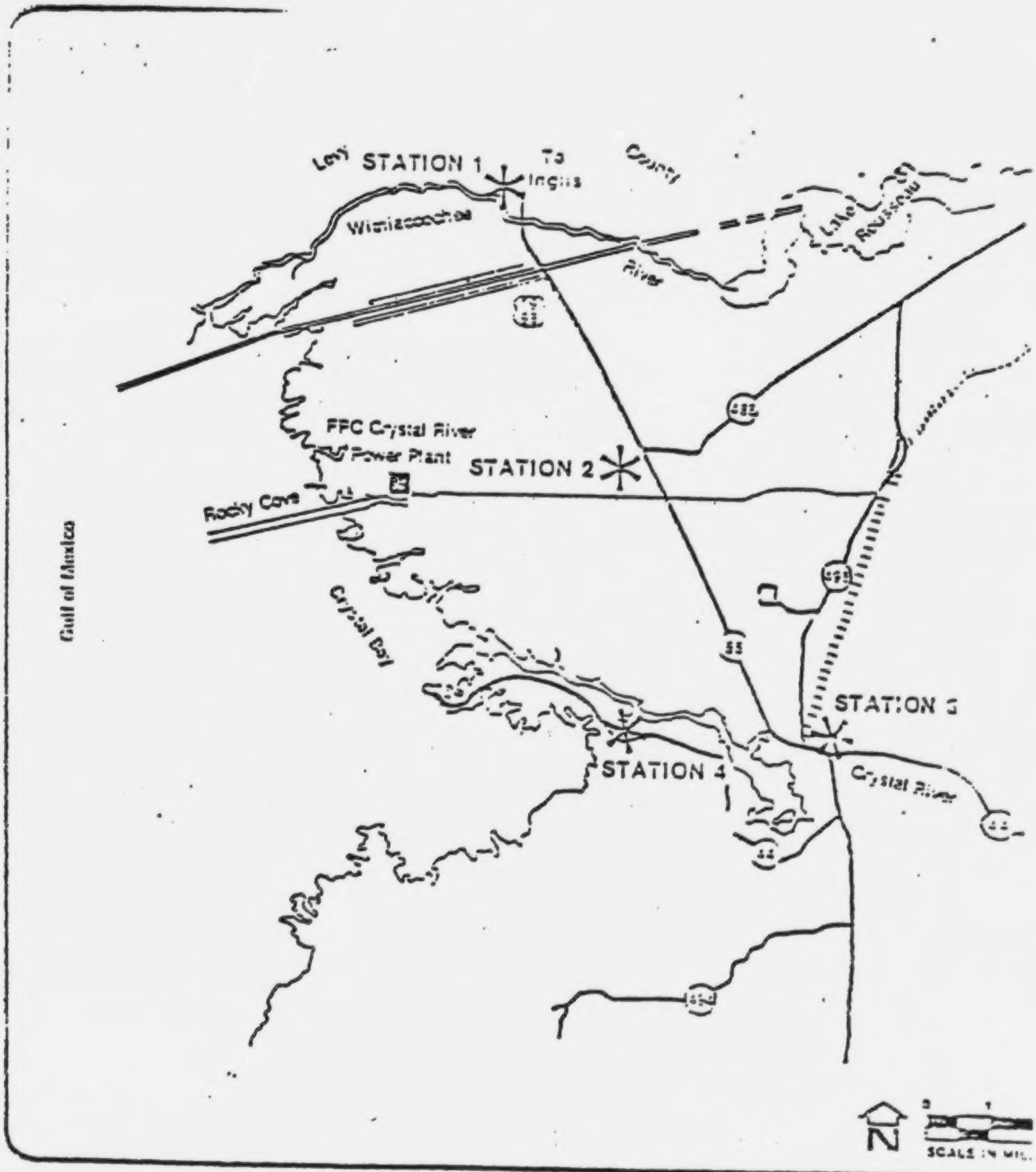
Levy
STATION 1
To Inglis
County
Withlacoochee
River
Lake Rousseau
19
488
FPC Crystal River Power Plant
STATION 2
Rocky Cove
Gulf of Mexico
Crystal Bay
495
19
STATION 3
STATION 4
Crystal River
44
44
494
N
0 1
SCALE IN MIL

AMBIENT AIR MONITORING LOCATIONS

SOURCE: ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., 1977

FLORIDA POWER CORPORATI

PROPOSED
CRYSTAL RIVER UNITS 4 &

CITRUS COUNTY, FLORIDA

Attachment 2

FLORIDA POWER CORPORATION
CRYSTAL RIVER UNITS 4 AND 5
PROPOSED LEACHATE MONITORING AND TESTING

I. Computerized and Manual Literature Search with the objective of obtaining an adequate data base from literature.

II. Pre-operational Water Table Monitoring Program with the objective to acquire 12-month baseline.

Install 12 Shallow Peizometer Well Points
Install 2 Deep Piezometer Well Points
Monitor Water Table Level
- 1 Well-Recorder to establish degree of tidal influence—one month
- 13 Wells--Weekly

Monitor In Situ (pH, Conducatance, Redox, Dissolved Oxygen)--Weekly (all Wells)
Monitor Key Water Quality Indicators--Monthly (4 Wells)
Monitor Extended Water Quality Indicators--Quarterly (4 Wells)
Monitor Rainfall and Evaporation--Weekly
Develop Flow Net and Water Budget

III. Laboratory Screening of Ash from Low Pyritic Sulfur Coal with the objective of evaluation of leachate formation and attenuation reactions. The program will establish the following:

- Percolation Rates of Compacted Ash (fly and bottom ash)
- Solute Release Rates
- Limestone Neutralization Effectiveness
- Clay Liner Effectiveness
- Correlate Extended and Key Water Quality Indicators
- Total Ash Leachate Capacity
- Active Area vs. Inactive Area Leachate Rates
- Available Fractions of Solutes

Techniques for Screening:

- Shake Test (fly, bottom ash)
- Column Leaching (6-10 months)
  - (1) Compacted Fly Ash (Lifts and Liners)
  - (2) Alternative Lifts of Ash and Limestone
  - (3) Ash with Clay Liner
  - (4) Ash with Compacted Limerock and Fly Ash Liner

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IV. Evaluate Leachate Attenuation in Subsoil and Water Table Aquifer

- Oxidation - Reduction
- Chemical Precipitation/Solubility/pH/Eh
- Adsorption Isotherms
- Ion Exchange Capacity
- Metals Content of Limerock

V. Cost-Effectiveness Evaluation of Alternative Liners

- Water Quality Criteria
- Biological Effects
- Cost of Leachate Control and Treatment
- Cost of Runoff Control and Treatment

VI. Develop Final Design for Field Test Cell Program Defined in Paragraph VII Below

VII. Field Test Cells Program with the Objective of Verifying

Monitor Water Budget
- Direct Infiltration Rates
- Direct Runoff
- Direct Rainfall
- Water Table

Potential Test Cell Configurations
- Ash with Compacted Fly Ash Liner Only
- Ash with Compacted Limestone and Fly Ash Liner
- Alterntive Lifts of Ash and Limestone with Compacted Fly Ash Liner
- Ash with Selected Clay Liner
- Alternative Caps and Vegetation

Monitor Leachate Formation and Attenuation

- 4 Well Clusters per Cell at Three Depths
- Weekly Water Table Elevation In Situ Water Quality from All Wells (pH, Conductance, Redox, Dissolved Oxygen)
- Monthly Key Indicators from 2 Clusters per Cell
- Quarterly Extended Indicators from 2 per Cell
- 2 Base Well Points Shall be Maintained Upslope of the Active Area.

VIII. Evaluate Leachate Management Program Results and Develop Final Design of Ash Storage Area.

IX. Periodic Reports on the Progress of This Program Will Be Submitted to the Department for its Information and Review.

X. In Situ Water Quality Indicators

pH
Conductance
Redox
Dissolved Oxygen

XI. Key Water Quality Indicators--Monthly

Conductance
pH
Redox
Dissolved Oxygen
Temperature
Color
Turbidity
Chloride
Iron
Cadmium
Zinc
Copper
Nickel
Selenium
Chromium
Arsenic
Beryllium
Mercury
Lead

XII. Extended Water Quality Indicators--Quarterly

Key Indicators Plus:

Total Dissolved Solids
Suspended Solids
Aluminum
Barium
Calcium
Magnesium
Sodium
Molybdenum
Vanadium
Cobalt
Gross Alpha
Total Dissolved Solids
Total Suspended Solids

BEFORE THE GOVERNOR AND CABINET
OF THE STATE OF FLORIDA

In Re: FLORIDA POWER)
CORPORATION CRYSTAL RIVER)
UNITS 4 AND 5, MODIFICATION)
OF CONDITIONS OF CERTIFICATION)
(PA 77-09).)
)

The following persons were present and participated in the disposition of this matter:

Honorable Bob Graham
Governor

Honorable George Firestone
Secretary of State

Honorable Jim Smith
Attorney General

Honorable Gerald A. Lewis
Comptroller

Honorable Bill Gunter
Treasurer and Insurance Commissioner

Honorable Ralph D. Turlington
Commissioner of Education

Honorable Doyle Conner
Commissioner of Agriculture

RECEIVED
MAR 4 1980
DIV. ENVIRONMENTAL
PERMITTING

MODIFICATION OF CERTIFICATION

BY THE GOVERNOR AND CABINET:

The Governor and Cabinet, sitting as the Board, having heard presentations by the parties, having reviewed the stipulation of the parties dated January 21, 1980, (attached and incorporated as Exhibit 1), and being otherwise fully advised herein, it is ORDERED:

1. The stipulation of the parties is approved in accordance with Section 403.516(2), Florida Statutes.

2. The special condition of certification II, A, 3 imposed upon Crystal River Units 4 and 5 by this Board's Order

dated November 21, 1978, is hereby modified as follows:

> "3. The zone of thermal mixing for cooling tower blowdown shall not extend beyond the western end of the north bank of the existing discharge canal. During discharge, the blowdown from the cooling tower for Units No. 4 and 5 shall be withdrawn at the point of lowest temperature of the recirculating cooling water prior to the addition of make-up water. The temperature at the point of discharge into the discharge canal shall not be greater than 96 degrees F., maximum two (2) hour average. The temperature of the water at the end of the discharge canal shall not exceed the limitations of Paragraph 17-3.05(1)(d) when only Units 4 and 5 are operating and one or more of the circulating water pumps from the existing units are operating."

DONE AND ENTERED this 22nd day of February, 1980, in Tallahassee, Florida, subsequent to a vote of the Governor and Cabinet at a duly constituted Cabinet meeting of February 22, 1980.

BY THE GOVERNOR AND CABINET
SITTING AS THE BOARD:

BOB GRAHAM
Governor

VOTE:

For:

Against:

Copies furnished to:

Wade L. Hopping, Esquire
Gary P. Sams, Esquire
L. M. Blain, Esquire
Thomas E. Cone, Esquire
Sheri W. Smallwood, Esquire
C. Laurence Keesey, Esquire
William S. Bilenky, Esquire
David Gluckman, Esquire

Appendix E
PSD Permit

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30308

MAR 30 1978

Mr. William S. O'Brien, Director
Licensing and Environmental Affairs
Florida Power Corporation
3201 34th Street, S
St. Petersburg, Florida 33711

Dear Mr. O'Brien:

Review of your November 30, 1977, application for two coal-fired steam electric generating units, has been completed. On the basis of this review, we have determined that the conditioned operation of the proposed plant at the specified location will not violate the Class I or Class II air quality increments specified in the EPA regulations for Prevention of Significant Deterioration (PSD). Furthermore, we have determined that this plant will meet the federal regulatory requirement under PSD that Best Available Control Technology (BACT) be used to limit emissions of sulfur dioxide and particulate matter.

A request for public comment regarding the preliminary determination on the above application was published on January 26, 1978. No comments were received during the public comment period. Authority to Construct a Stationary Source is hereby issued for the facility described above, subject to the attached conditions. This Authority to Construct is based solely on the requirements of 40 CFR 52.21, the Federal regulations governing significant deterioration of air quality. It does not apply to NPDES or other permits issued by this agency or permits issued by other agencies. Additionally, construction covered by this Authority to Construct must be initiated by December 1, 1978.

Please be advised that a violation of any condition issued as part of this approval, as well as any construction which proceeds in material variance with information submitted in your application, will be subject to enforcement action.

Authority to Construct will take effect on the date of this letter. The complete analysis which justifies this approval has been fully documented for future reference, if necessary. Any questions concerning this approval may be directed to Ray Cunningham, Chief, Air Strategy Development Section (404/881-3286).

Sincerely yours,

for John A. Little, Deputy
John C. White
Regional Administrator

Attachment

This Approval to Construct would be issued this date Feb. 27, 1978, but for the order entered in Environmental Defense Fund versus Environmental Protection Agency, No. 78-281 (D.D.C). (entered on February , 1978.)

John A. Little

Please be advised that a violation of any condition issued as part of this approval, as well as any construction which proceeds in material variance with information submitted in your application, will be subject to enforcement action.

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John C. White
Regional Administrator

Attachment

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John A. Little

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CONDITIONS TO APPROVAL

1. Related to particulate emissions from the boilers:

   a. The applicant must submit to EPA, within five working days after it becomes available, copies of all technical data pertaining to the selected control device(s), including formal bids from the vendors awarded the contracts, guaranteed efficiency or emission rate(s), and all design parameters. A list of any additional required information will be sent to the applicant upon receipt of this submittal. Although the type of control device which is described in general in the application has been determined by EPA to be adequate, EPA must review the specific specifications for the control device selected by the company to verify the selected control equipment will enable applicable emission limits to be met by the new units. EPA may, upon review of these data, disapprove the application if EPA determines the selected control device is inadequate to meet the emission limits specified in this conditional approval. EPA shall notify the applicant of EPA's determination under this condition within twenty working days after receipt of all necessary information from the applicant. In the event EPA disapproves the application pursuant to this condition, EPA will state its reasons in writing, identifying the criteria applied and the factors considered.

   b. The source must meet an emission limit, as measured under part 3 (below) as follows:

      i. Particulate matter emitted to the atmosphere from the boiler shall not exceed 0.18 gram per million calories heat input (0.10 pound per million BTU heat input).

ii. Opacity of emissions from the boilers shall not exceed 20 percent except for one six minute period per hour during which the opacity may not exceed 27 percent. (Use Reference Method 9, Appendix A in 40 CFR 60.)

These emission limitations are identical to those required by Federal New Source Performance Standards, 40 CFR 60.

2. Related to sulfur dioxide emissions from the boilers:

The source must meet an emission limit, as measured under part 3 (below) as follows:

Sulfur dioxide emitted to the atmosphere from each boiler shall not exceed 2.2 grams per million calories heat input (1.2 pounds per million BTU heat input).

This emission limitation is identical to that required by Federal New Source Performance Standards, 40 CFR 60.

3. Stack Testing:

a. Within 60 days after achieving the maximum capacity at which the facility will be operated, but no later than 180 days after initial startup, the owner or operator shall conduct performance tests and furnish EPA a written report of the results of such performance tests.

b. Performance tests shall be conducted and data reduced in accordance with methods and procedures specified by EPA. Reference Methods 1-5 as published in Appendix A of 40 CFR 60 will be used for particulate tests. Reference Method 6 will be used for SO_2 tests.

c. Performance tests shall be conducted under such conditions as EPA shall specify based on representative performance of the facility. The owner or operator shall make available to EPA such records as may be necessary to determine the conditions of the performance tests.

d. The owner or operator shall provide 30 days prior notice of the performance tests to afford EPA the opportunity to have an observer present.

e. The owner or operator shall provide or cause to be provided, performance testing facilities as follows:

   i. Sampling ports adequate for test methods applicable to the facility.

   ii. Safe sampling platform(s).

   iii. Safe access to sampling platform(s).

   iv. Utilities for sampling and testing equipment.

f. Each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified by EPA. For the purpose of determining compliance with an emission limitation, the arithmetic mean of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the owner or operator's control, compliance may, upon the approval of EPA, be determined using the arithmetic mean of the other two runs.

4. Coal Characteristics and Contracts

Before approval can be granted by EPA for purchase of a control device under condition 1.a. above, characteristics of the coal to be fired must be known. Therefore, before these approvals are granted, the applicant must submit to EPA copies of coal contracts which should include the expected sulfur content, ash content, and heat content of the coal to be fired. These data will be used by EPA in its evaluation of the adequacy of the control devices. Also, the applicant must demonstrate the ability to acquire a low sulfur coal supply of sufficient length to enable the installation of sulfur removal equipment if the supplies of low sulfur coal should not become available or be discontinued. Therefore, the coal contracts must be for a period of at least three (3) years from the date of start-up of the boiler.

5. As an alternative to the submittal of contracts for purchase of coal under condition 4 above, the applicant may submit the following information:
   (a) The name of the coal supplier;
   (b) The sulfur content, ash content, and heat content of the coal as specified in the purchase contract;
   (c) The location of the coal deposits covered by the contract (including mine name and seam);
   (d) The date by which the first delivery of coal will be made;
   (e) The duration of the contract; and
   (f) An opinion of counsel for the applicant that the contract(s) are legally binding.

6. Reporting:

Beginning one month after final conditional construction approval from EPA and ending when submittals required under parts 1.a. and 4. have been evaluated and approved by EPA, the applicant shall submit to EPA a quarterly status report briefly outlining progress made on engineering design and purchase of major pieces of equipment (including control equipment). All reports and information required to be submitted under this part of the PSD review and approval shall be submitted to Mr. Asa B. Foster, Director, Air and Hazardous Materials Division, EPA Region IV, 345 Courtland Street, N.E., Atlanta, Georgia 30308.

7. Emission Control Systems:

Prior to operation of the source, the owner or operator shall submit to EPA a standardized plan or procedure that will allow the company to monitor emission control equipment efficiency and enable the company to return malfunctioning equipment to proper operation as expeditiously as possible.

E-6

8. Stack Parameters:

This approval is based on the stack parameters submitted by the Florida Power Corporation on November 30, 1977, Section VI - Stack and Pollutant Emissions Data, EPA Air Pollutant Emissions Report.

9. Related to particulate emissions from the coal handling facilities:

   a. The applicant shall not cause to be discharged into the atmosphere from any coal processing or conveying equipment, coal storage system or coal transfer and loading system processing coal, visible emissions which exhibit 20 percent opacity.

   b. The applicant must submit to EPA, within five (5) working days after it becomes available, copies of technical data pertaining to the selected particulate emissions control device for the coal handling facility. These data should include, but not be limited to, a copy of the formal bid from the successful bidder, guaranteed efficiency and emission rates, and major design parameters such as air/cloth ratio and flow rate. EPA may, upon review of these data, disapprove the application if EPA determines the selected control device to be inadequate to meet the visible emission limit specified in 9(a) above.

10. On the date of issuance of EPA's approval to construct Units #4 and #5, the allowable SO_2 emission limits for Units #1 and #2 shall be restricted to no more than 5.00 lb per million BTU heat input on a daily basis, and 4.5 $lb/10^6$ BTU on a monthly. Forty-five days after the issuance of this approval, and in the future, as may be requested by EPA, the Company shall certify to the Regional Administration, compliance with these emission limits. Chemical fuel analysis shall be deemed appropriate for this certification.

11. Six months prior to start-up of Unit #4, both Units #1 and #2 will meet the emission limit of 2.9 lb SO_2/mm Btu. This emission limit will be demonstrated by the owner or operator by conducting performance tests and furnishing EPA a written report of the results of such performance tests. Conditions 3.b through f. apply to stack tests required under this part.

12. Six months prior to start-up of Unit #5, both Units #1 and #2 will meet the emission limit of 2.1 lb SO_2/mm Btu. This emission limit will be demonstrated by the owner or operator by conducting performance tests and furnishing EPA a written report of the results of such performance tests. Conditions 3.b. through f. also apply to stack tests required under this part.

13. The company will maintain and operate existing Units #1 and #2 with the applicable particulate emission limit of 0.1 lb/mmBtu heat input during the SO_2 emission reduction program established under conditions 11 and 12 above. Failure to maintain compliance during this period and thereafter will subject the company to appropriate enforcement action.

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Site 2 with once through cooling system;
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Site 3 with once through cooling system;
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Attachment 1. Program Review and Statistical Evaluation Synopsis;
Attachment 2. Water Quality Summary;
Attachment 4. Example of Physical Plant Data Format. Data is stored on computer tape;
Attachment 5. Synopsis of Research Publications of the Hydrographic Study;
Attachment 6. Thesis of Mr. Ronald Klausewitz containing Thermal Plume Model Verification;
Attachment 7. Source of Cooling Water Study;
Attachment 8. Summary of Phytoplankton Data;
Attachment 9. "Evaluations of Interactions between a Power Generation Facility and a Contiguous Estuarine Ecosystem." Samuel C. Snedaker and staff;
Attachment 10. Map of Approximate Macrophyte Standing Crop. Martin vanTine;
Attachment 11. Juvenile Fish Entrapment Study;
Attachment 12. Intake Velocity Measurements Taken at the Travelling Screens of Units 1 and 2;
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